D.T.E. 01-20

Investigation by the Department of Telecommunications and Energy on its own Motion into the Appropriate Pricing, based upon Total Element Long-Run Incremental Costs, for Unbundled Network Elements and Combinations of Unbundled Network Elements, and the Appropriate Avoided-Cost Discount for Verizon New England, Inc. d/b/a Verizon Massachusetts' Resale Services in the Commonwealth of Massachusetts.

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EXECUTIVE SUMMARY
D.T.E. 01-20

In this Order in D.T.E. 01-20, the Massachusetts Department of Telecommunications and Energy ("Department") establishes new rates for Verizon-Massachusetts' unbundled network elements ("UNEs") and interconnection. These rates are for services used by competitive local exchange carriers ("CLECs") to provide competing retail telecommunications services to Massachusetts' consumers. The rates were developed by applying a Federal Communications Commission ("FCC") cost standard, known as Total Element, Long-run, Incremental Cost ("TELRIC"), which calculates the cost for an efficient carrier to provide UNEs and interconnection in a competitive wholesale market. The Department's comprehensive 18-month investigation in D.T.E. 01-20 examined a myriad of cost issues bearing on the development of recurring and non-recurring rates for UNEs and interconnection, including UNE loops, switching, inter-office transport, collocation, and Operation Support Systems ("OSS"). While the Department makes determinations on all cost issues in the case, this Order does not contain specific rates; Verizon is required to submit a compliance filing within 25 days that will contain new rates based on the cost findings in the Order. This is the Department's second review of TELRIC-based rates, the first being in 1996 in the Department's Consolidated Arbitrations.

I. INTRODUCTION

A. Procedural History

The Department of Telecommunications and Energy ("Department") issued its Vote and Order to Open Investigation ("Vote and Order") in this proceeding on January 12, 2001. The Department first set unbundled network element rates, rates for interconnection, and the avoided cost discount for resale services in Massachusetts in the 1996 Consolidated Arbitrations proceeding, and this review is undertaken pursuant to the five-year cycle established in Investigation of Resale Tariff of Bell Atlantic, D.T.E. 98-15-Phases II/III (March 19, 1999).

Eighteen days of evidentiary hearings were held at the Department's offices between January 7, 2002, and February 15, 2002.

B. Participating Parties

Pursuant to G.L. c. 12, § 11E, the Attorney General of the Commonwealth filed a notice of intervention in the proceeding. Additionally, the Department granted the motions to intervene of Verizon New England, Inc. d/b/a Verizon Massachusetts ("Verizon"); AT&T Communications of New England, Inc. ("AT&T"); Brahmacom, Inc.; Essential.com, Inc.; Norfolk County Internet, Inc.; Servisense, Inc.; Conversent Communications of Massachusetts, LLC; FairPoint Communications Solutions Corporation; Freedom Ring Communications d/b/a Bay Ring Communications; the Association of Communications Enterprises; XO Massachusetts, Inc.; Global NAPs, Inc.; PaeTec Communications, Inc.; RNK Inc. d/b/a RNK Telecom; Sprint Communications Company L.P.; the United States Department of Defense and All Other Federal Executive Agencies ("DOD/FEA"); WorldCom, Inc. ("WorldCom"); Z-Tel Communications, Inc. ("Z-Tel"); Allegiance Telecom of Massachusetts, Inc. ("Allegiance Telecom"); Covad Communications Company ("Covad"); El Paso Networks, LLC ("El Paso"); and Network Plus, Inc. ("Network Plus"). The Department granted limited participant status to: Adelphia Business Solutions; New England Cable Television Association, Inc.; and Network Access Solutions Corporation.

Verizon, AT&T, WorldCom, Z-Tel, the CLEC Coalition (Covad, Allegiance Telecom, El Paso, and Network Plus), and the DOD/FEA sponsored witness testimony. Verizon and AT&T submitted cost studies.

II. SUMMARY OF FINDINGS

A. Cost Models

The Department found that Verizon sustained its burden of proving the reasonableness of its Loop Cost Analysis Model ("LCAM"), and that LCAM, with the various modifications as directed in the Order, is the more reliable tool for computing UNE costs. The Department rejected the Hatfield Model because (1) it relies on a proprietary third-party database, which necessarily limits parties' and the Department's access to critical underlying information, and (2) its 1400 user-specified inputs are, in many instances, based on national data, which do not necessarily correspond to the least-cost technology and operations for Verizon in Massachusetts.

B. General Inputs

1. Cost of Capital

The Department found that a cost of capital of 11.45 percent accurately reflects the forward-looking risk of investment for Verizon under competitive conditions created by the Telecommunications Act of 1996. The 11.45 percent cost of capital is based on a debt to equity ratio of 25 percent debt and 75 percent equity, a 7.55 percent cost of debt, and a 12.75 percent cost of equity.

2. Depreciation

The Department found that the low end of the 1999 FCC-established range is reasonable and appropriate for depreciation lives in a TELRIC study for Massachusetts.

3. Annual Cost Factors ("ACFs")

a. Forward-Looking to Current Conversion Factor ("FLC")

The Department determined that Verizon's ACFs should be adjusted by a FLC, and directed Verizon in its compliance filing to file a new FLC that shows in detail how the level of investment in each plant account has changed and how it calculated a new FLC. In addition, the Department directed Verizon to re-file the Network, Wholesale Marketing, Other Support, and Common Overhead ACFs reflecting a new FLC.

b. Productivity and Merger Savings

The Department found that, by using 1999 as the base year, Verizon failed to account fully for the impact of the Bell Atlantic/NYNEX merger on its forward-looking costs, and directed Verizon to use a productivity offset of 4.5 percent for the years 2002 through 2004. The cumulative productivity of 12.90 percent is intended to address the following: (1) the effect of the likely overstatement of expenses in the 1999 base year resulting from the fact that the 1999 Bell Atlantic/NYNEX integration expenses in that year are not representative of the forward-looking period; (2) the Bell Atlantic/NYNEX expense savings were not anticipated to be fully ramped up until 2000, a year after the base year; and (3) the beneficial impact of the Bell Atlantic/GTE merger on Verizon's productivity.

c. Retail-related Expenses

With the exception of wholesale advertising expenses, the Department directed Verizon to revise its ACFs to exclude all retail-related expenses to the extent required by the Consolidated Arbitrations.

d. Network ACFs

The Department directed Verizon to revise the proposed reduction of "M" and "R" dollars for copper cables to five percent and fifteen percent, respectively. In addition, the Department directed Verizon to re-file Network expenses based on revised network assumption and inputs.

e. Common Overhead ACF ("ACF_{COH}")

The Department found that legal expenses are the costs Verizon legitimately incurs in the course of provisioning UNEs to CLECs and thus Verizon should be allowed to recover them. The Department also approved Verizon's approach of a weighted average FLC for the ACF_{COH}.

f. Other Support ACF

The Department determined that Verizon's method of calculating and allocating Other Support expenses is fair and reasonable.

g. Wholesale Marketing ACF

The Department directed Verizon to revise its proposed "avoided" costs discount of 40.42 percent in Product Management using the current "avoidable" cost discount. In addition, the Department found that Verizon should be allowed to recover expenses for wholesale advertising; however, the Department found that wholesale advertising expenses should be based on Verizon's 2002 wholesale advertising budget rather than Verizon's 1999 retail advertising budget.

C. Outside Plant Inputs

1. Inputs for Basic Loops

a. Average Distribution Loop Length

The Department found that the combined effect of Verizon's two assumptions (i.e., a uniform distribution of customer locations and the use of a one half of the longest distribution loop of each distribution area ("DA") as the average loop length) on distribution loop length and loop costs is negligible, and therefore adopted Verizon's average distribution loop length.

b. Average Feeder Loop Length (Feeder Routing)

The Department adopted Verizon's proposed feeder loop lengths, finding that conducting a study of rerouting requires Herculean efforts and that the FCC suggests using the actual average loop lengths.

c. Technology Mix for Feeder: Copper vs. Fiber

The Department adopted 100 percent fiber (i.e., zero threshold) in the Metro zone, as proposed by Verizon. For the remaining three zones, however, the Department directed Verizon to use a 9,000 feet threshold. The Department estimates that a zero threshold in the Metro zone and a 9,000 feet threshold in the remaining three zones yield approximately 41.2 percent copper and 58.8 percent fiber.

d. Fiber Feeder Technology Choice: Universal Digital Loop Carrier ("UDLC") vs. Integrated Digital Loop Carrier ("IDLC")

The Department agreed with Verizon that GR-303 with unbundling capability at the DS0 level is not a TELRIC-compliant technology upon which to base UNE rates. The Department concluded that some level of UDLC should be present in a forward-looking network in order to provide the function of unbundling loops at the DS0 level, which IDLC with GR-303 cannot currently provide. The Department determined, however, that Verizon has failed to show that its proposed UDLC proportion is reasonable. The Department directed Verizon to revise its proposed ratio of IDLC to UDLC to 2:1. Based on the Department's ruling on the copper/fiber thresholds and the resulting copper/fiber proportion, the Department concluded that the copper/IDLC/UDLC proportion should be approximately 41.2/39.2/19.6.

e. Digital Loop Carrier ("DLC") Concentration Ratio

The Department found that Verizon failed to substantiate its proposed 3:1 concentration ratio, and directed Verizon to adjust the ratio for GR-303 equipment to 4:1 in order to recognize the opportunity for Verizon to take advantage of differing residential and business traffic patterns.

f. DLC Cost Inputs

The Department adopted Verizon's proposed Engineering, Furnished & Installed ("EF&I") factor, finding that the data provided by Verizon show reasonable forward-looking discount rates for material costs of DLC equipment and that the EF&I is based on those declining material costs.

g. Dedicated Remote Terminal

The Department approved Verizon's proposal, concluding that it is reasonable to assume that high-rise buildings should have dedicated remote terminals in their locations to take advantage of the high density of lines in high-rise buildings.

2. Fill Factors:

The Department made the following findings concerning fill factors:

Distribution	48 percent
Copper Feeder and RT Common Equipment	69 percent
Fiber Feeder	75 percent
Duct	55.4 percent
RT Channel Units	88 percent
CO Terminal	To be re-filed
HARC	51.3 percent
Dark Fiber Loop	75 percent
Dark Fiber IOF	80 percent

3. House and Riser Cable ("HARC") Issues

The Department directed Verizon to charge the non-recurring cost ("NRC") for an intermediate terminal block only when it is requested. Regarding the issue of work time (or task time) estimates for termination activities, the Department adopted a total work time estimate of 83 minutes (i.e., 53 minutes for travel time, 10 minutes for the placement of terminal block, a cable termination rate of 150 pairs per hour, and elimination of the backboard element and the cost of the cable stub). In addition, the Department adopted a horizontal cable length of 135 feet.

4. Geographic Zones for Deaveraging Loop Costs

The Department found that it could better assess whether significant cost differences exist between the Urban and Metro zones, and thus make an informed decision about the appropriate number of density zones for Massachusetts, upon review of Verizon's compliance filing. As a result, the Department directed Verizon to submit cost results for, alternatively, four density zones and three density zones. The Department also directed Verizon to deaverage dark fiber loop costs because there are significant cost variations among different zones.

5. Line Sharing and Line Splitting

The Department concluded that Verizon should be allowed to recover line sharing and line splitting OSS costs and directed Verizon to apply this rate retroactively to April 1, 2001, the date its system modifications were integrated. The Department also ordered Verizon to submit additional evidence, such as demand forecasts by state in the Verizon-East footprint, to substantiate its line sharing and line splitting demand forecast for Massachusetts versus across the Verizon-East footprint. In addition, the Department approved Verizon's splitter cost studies.

6. Other xDSL Issues

The Department upheld its previous determination that the Wideband Testing ("WTS") charge should be optional. The Department also upheld its previous ruling that Verizon should absorb the cost of cooperative testing. Concerning the issue of DSL-capable fiber-fed loops, the Department found that Verizon has no obligation, with respect to this TELRIC proceeding, to tariff charges for fiber-fed DSL-capable loops, and that this issue is being addressed in D.T.E. 98-57-Phase III. In addition, the Department denied Verizon's request to charge for conditioning loops greater than 18,000 feet but allowed Verizon to continue to charge for loop conditioning on CSA-compliant loops of less than 18,000 feet. With respect to loop conditioning work time estimates, the Department found that its findings with respect to NRC task times would apply. Regarding loop qualification, the Department denied Verizon's proposed charges. Lastly, the Department rejected Verizon's proposed charge to add electronics for ISDN-type services

D. Switching

1. Switching Inputs

The Department directed Verizon to use a blend of 90 percent new switches and ten percent growth switches and approved Verizon's proposed vendor supply ratio of 57.5 percent Lucent 5ESS switches and 42.5 percent Nortel DMS 100 switches. The Department approved the discount that Verizon proposed for Nortel-supplied new and growth switching equipment and specified discounts for Lucent-supplied new and growth equipment. The Department also directed Verizon to assign "getting started" and Equivalent POTS Half Calls ("EPHC") costs to the non-traffic sensitive category, as opposed to the minute-of-use ("MOU") traffic-sensitive cost category. The Department approved Verizon's proposed trunk utilization factors and denied Verizon's feature port additive costs. The Department directed Verizon to use an EF&I factor of 29 percent, consisting of 12 percent vendor costs, 12 percent engineering and labor costs, and 5 percent sales tax rather than the approximate 40 percent factor that Verizon proposed. With respect to the call competition ratio, the Department found that Verizon's study was based on old data and directed Verizon to submit more up-to-date call completion data in its compliance filing; if such data are not available, Verizon is directed to use an 80 percent call completion ratio. Lastly, the Department adopted 308 days as a basis for computing MOU costs and 7.0 percent Busy-Hour-to-Any-Hour-of-the-Day ("BH/AHD") factor.

2. Right to Use ("RTU") Fees

The Department directed Verizon to: (1) eliminate the cost of the one-time accounting change and to use more recent 2001 RTU data in its compliance filing; and (2) assign RTU costs to non-traffic-sensitive UNEs.

3. Reciprocal Compensation

The Department found that Verizon's rates for reciprocal compensation and terminating usage should be identical because the costs associated with these two UNEs are identical.

E. Interoffice Facilities ("IOF")

For the issues in dispute, the Department: (1) adopted 3.83 nodes for computing both fixed and distance-sensitive IOF costs; (2) adopted a 53.2 percent EF&I factor; (3) adopted an 80 percent fiber utilization factor and an 83 percent utilization factor for the eleven other IOF UNEs; (4) approved inclusion of Digital Cross-Connect System ("DCS") investment in the portion of its IOF cost study which is associated with interconnection of facilities, but concluded that Verizon must include two options in its tariff, one a bundled DCS option and the other an option offering DCS at the terminating ends on an unbundled basis; (5) rejected Verizon's proposed use of weighting average distances by the quantity of circuits and its proposed 37.52 miles, and directed Verizon to re-compute the weighted average distance based on a representative sample of the data in its Trunk Information Record Keeping System ("TIRKS"); and (6) adopted Verizon's 90:10 ratio of Fujitsu to Lucent equipment.

F. Collocation

The Department directed Verizon to reduce its proposed Administration and Engineering fees by 20 percent. The Department also adopted Verizon's proposed Building Expense charge that includes renovations and temporary structures. Concerning the Space Conditioning Charge, the Department directed Verizon to replace the credit mechanism with a monetary refund to a vacating CLEC upon subsequent occupation of that space; however, the Department clarified that Verizon is not required to refund money to CLECs vacating the market when a balance is owed to Verizon. Regarding the DC Power Consumption charge, the Department (1) adopted a Power Installation Factor of 2.15, (2) approved the use of the Digital Circuit ACF instead of the Digital Switch ACF, (3) approved the use of DC amps instead of AC amps in calculating a unit cost of DC power consumption for the Emergency Engine, (4) deaveraged rates for Power consumption for different zones, and (5) approved the assessment of the Power Consumption rate immediately upon a CLECs' occupying collocation space. With respect to the DC Power Distribution charge, the Department adopted an average one-way cable distance of 60.5 feet and directed Verizon to apply the Digital Circuit ACF rather than the Digital Switch ACF to the power cable. Concerning cageless collocation security costs, the Department found that Verizon should not be required to share a portion of these costs and thus approved Verizon's proposal. Lastly, the Department required Verizon to submit with its compliance filing a plan transition plan related to its proposal to change the way CLECs are charged from a recurring cost structure for interconnection arrangements used to a nonrecurring cost structure for arrangements ordered.

G. Nonrecurring Costs ("NRCs")

The Department found that recurring and nonrecurring models for UNEs should be based on the same network assumptions. The Department also directed Verizon to recover the field installation costs and loop maintenance costs as recurring costs. Regarding Verizon's Task Time Methodology, the Department directed Verizon to use the low end of the 95 percent confidence interval around each of the task times that it used in its nonrecurring cost model ("NRCM"). In addition, the Department directed Verizon to decrease its proposed Forward-looking Adjustment factor ("FLAF") by 20 percent across the board for NRCs. Concerning fallout, the Department adopted a two percent fallout rate, the same rate adopted in the Phase 4-L Order. The Department approved Verizon's proposal to recover disconnection charges upfront, based on the average estimated life of 2.5 years. The Department also approved Verizon's proposal to deaverage the non-recurring costs of "hot cuts" and initial orders, and also approved Verizon's proposal to compute loop costs on a first-loop-per-order and additional-loop-per-order basis instead of computing costs based on a single order, an order of two to nine loops, and an order of ten or more loops.

The Department also directed Verizon to adjust specific aspects of its hot cut cost study in order to make its study more forward-looking. Specifically: (a) Verizon shall use the low end of the 95 percent confidence interval for hot cut task times; (b) Verizon shall revise its cost calculations for task 1 and 2 of the TISOC to be consistent with OSS fallout of 2 percent; (c) for the activities within the CO Frame Work Group, Verizon shall apply a FLAF of 50 percent to tasks 1 and 3, and a FLAF of 60 percent to task 15; tasks 17 and 18, which involve work related to field installation, should be removed from the NRCM; (d) for the activities within the RCCC, Verizon shall apply a FLAF of 50 percent to tasks 3, 18, 19, 20, and 21; a FLAF of 25 percent to task 6; and a FLAF of 60 percent to tasks 33 and 34; (e) Verizon shall apply a FLAF of 50 percent to the one MLAC task (i.e., to assign outside plant and central office facilities for non-flowthrough service orders); (f) Verizon shall apply a FLAF of 50 percent to the RCMAC task 1; (g) the general directive regarding adjustments to FLAFs shall apply to those tasks that we do not address specifically; and (h) the task time adjustment directed in "Task Time Methodology" section applies to all the task time estimates in the NRCM, including the hot cut tasks. Lastly, the Department ordered Verizon to develop a less costly hot cut process for CLECs that do not want all of the steps contained in the existing process, fashioned on SBC's two-tier approach in Texas.

H. OSS

Because Verizon subtracted approximately $48 million of ongoing OSS-related costs from the Other Support ACF to remedy the concerns raised in the Department's Phase 4-L Order, the Department found that Verizon could recover the cost for access to OSS. The Department disallowed Verizon's proposed computer hardware costs because they are not forward-looking, but allowed recovery of software maintenance expenses. The Department directed Verizon to spread its OSS costs among the total number of access lines projected from 2002 through 2007. Lastly, the Department disallowed Verizon's proposed Daily Usage File ("DUF") charge.

I. Review Cycle

The Department maintained its existing five-year review cycle and will decide whether a review cycle of fewer than five years is warranted on a case-by-case basis.

III. CONCLUSION

The Department ordered Verizon to submit a compliance filing, consistent with the findings in this Order, within 25 days of the date of its issuance. The compliance filing shall include: proposed tariff pages with proposed rates, with an effective date corresponding to the day the pages are filed; a comparison of proposed rates with existing rates; and a request for approval to put the rates in effect in less than 30 days, subject to true-up after the Department reviews the compliance filing.

TABLE OF ABBREVIATIONS & ACRONYMS
DTE 01-20

AC Power:	Alternating Current Power
ACF:	Annual Cost Factor
ADM:	Add/Drop Multiplexer
ADSL:	Asymmetrical Digital Subscriber Line
AHD:	All Hours of the Day
ALJ	Administrative Law Judge
ARMIS:	Automated Record Management Information System
BDFB:	Battery Distribution Fuse Bay
BH/AHD:	Busy-Hour-to-Any-Hour-of-the-Day
BOC:	Bell Operating Company
BPU	Board of Public Utilities
CAPM:	Capital Asset Pricing Model
C/B Ratio:	Current to Book Investment Ratio
CCOE:	Cageless Collocation Open Environment
CCS:	One Hundred Call-Seconds
CHC:	Coordinated Hot Cut
CLEC:	Competitive Local Exchange Carrier
CLEC Coalition:	Allegiance Telecom of Massachusetts, Inc., Covad Communications Company, El Paso Networks, LLC, and Network Plus, Inc.
CO:	Central Office
COT:	Central Office Terminal
CPC:	Circuit Provisioning Center
CPI:	Consumer Price Index
CPU:	Central Processing Unit
CSA:	Carrier Serving Area
CUDS:	Call Usage Detail Service
DA:	Distribution Area
DC Power:	Direct Current Power
DCAS:	Direct Customer Access System
DCF:	Discounted Cash Flow
DCNDR Group:	VZ's Data Center, Network, and Distributed Resources Group
DCS:	Digital Cross-Connect System
DCPR:	Detailed Continuing Property Record
DDS:	Digital Data Service
DLC:	Digital Loop Carrier

DS0:	Digital Signal Level 0
DS1:	Digital Signal Level 1
DSL:	Digital Subscriber Line (also xDSL)
DSLAM:	Digital Subscriber Line Access Multiplexer
DTS:	Dedicated Transit Service
DUF:	Daily Usage Files
DWDM:	Dense Wavelength Division Multiplexing
ECRIS:	Engineering Cost Records Information System
EEL:	Enhanced Extended Link
EF&I:	Engineer, Furnish & Install
E/I ratio:	ratio of Expenses to Investments
EPHC:	Equivalent POTS Half Calls
FCC:	Federal Communications Commission
FDF:	Fiber Distribution Frame
FDI:	Feeder Distribution Interface
FDT:	Frame Due Time
FLAF:	Forward-Looking Adjustment Factor
FLC:	Forward-Looking to Current Conversion (factor)
FRC:	Field Reporting Code
GAAP:	Generally Accepted Accounting Principles
GIGs:	Gigabytes of Memory
GR-303:	A set of technical specifications from Telcordia, used to concentrate telephone traffic
GUI:	Graphical User Interface
HAI:	Hatfield Model
HAI 5.2a-MA:	Hatfield Model Release 5.2a-MA
HARC:	House and Riser Cable
HDSL:	High Bit-Rate Digital Subscriber Line
HMO:	Health Maintenance Organization
HVAC:	Heating, Ventilation, and Air Conditioning
IDLC:	Integrated Digital Loop Carrier
ILEC:	Incumbent Local Exchange Carrier
IOF:	Interoffice (transmission or transport) Facility
ISDN:	Integrated Services Digital Network
IXC:	Interexchange Carrier
L&B:	Land and Building

LATA:	Local Access and Transport Area
LCAM:	Loop Cost Analysis Model
LEC:	Local Exchange Carrier
LSR:	Local Service Request
“M” dollars	expenses attributable to rearrangements due to customer moves, municipal requirements, and network upgrades
M&R:	Maintenance and Repair
Mbps	million bits per second
MDF:	Main Distribution Frame
MIPS:	Millions of Instructions Per Second
MLAC:	Mechanized Loop Assignment Center
MOU:	Minutes of Use
MTAU:	Metallic Test Access Units
MTU:	Multi-Tenant Unit
NALM:	National Access Line Model
NERA:	National Economic Research Associates
NID:	Network Interface Device
NCT:	Non-Conversation Time
NGDLC:	Next Generation Digital Loop Carrier
NRC:	Nonrecurring Costs
NRCM:	Nonrecurring Cost Model
NYNEX:	New England Telephone and Telegraph Company
NYPSC:	New York Public Service Commission
OC3:	Optical Carrier Level 3
OC12:	Optical Carrier Level 12
OC48:	Optical Carrier Level 48
ONA:	Open Network Architecture
OS:	Operational System
OSP:	Outside Plant
OSS:	Operations Support Systems
PAP:	Performance Assurance Plan
POP:	Point of Presence
POT:	Point of Termination bay
POTS:	Plain Old Telephone Service
PSC:	Public Service Commission
PUC:	Public Utilities Commission
“R” dollars	the costs associated with maintenance and repair for copper cables
RCCC:	Regional CLEC Coordination Center

RCMAC:	Recent Change Memory Administration Center
ROE:	Return On Equity
RT:	Remote Terminal
RTU:	Right to Use
S&P:	Standard & Poor’s
SAI:	Serving Area Interface
SBC:	Southwestern Bell Communications
SCOPE:	Secured Collocation Open Physical Environment
SCIS:	Switching System Cost Information System
SEC:	Securities and Exchange Commission
SLUS:	Subscriber Line Usage Study
SME:	Subject Matter Expert
SONET:	Synchronous Optical Network
SWBT:	Southwestern Bell Telephone
T1:	Trunk Level 1
TCI:	Total Cost Installed
TELRIC:	Total Element Long-Run Incremental Cost
THC:	Telephone Holding Company
TIGER:	Topologically Integrated Geographic Encoding and Referencing
TISOC:	Telecom Industry Services Operating Center
TNS:	TNS Telecoms
TOF:	Typical Occurrence Factor
UDLC:	Universal Digital Loop Carrier
UNE:	Unbundled Network Element
UNE-L:	UNE Loop
UNE-P:	UNE Platform
USF:	Universal Service Fund
V&H:	Vertical and Horizontal
WTS	Wideband Testing System
xDSL:	x-Digital Subscriber Line

I. INTRODUCTION

A. Procedural History

1. Regulatory Context

The Department of Telecommunications and Energy ("Department") issued its Vote and Order to Open Investigation ("Vote and Order") in this proceeding, docketed as D.T.E. 01-20, on January 12, 2001. The Department first set unbundled network element ("UNE") rates, rates for interconnection, and the avoided-cost discount for resale services in Massachusetts in the 1996 Consolidated Arbitrations proceeding,[1] and this review is undertaken

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[1] Consolidated Arbitrations, D.P.U. 96-73/74, 96-75, 96-80/81, 96-83, 96-94. The Department established UNE prices in the Consolidated Arbitrations decisions and also in D.T.E. 98-15 (investigating Bell Atlantic resale tariff) and D.T.E. 98-57 (investigating Bell Atlantic Tariffs Nos. 14 and 17).

The existing recurring UNE rates are addressed in orders in: Consolidated Arbitrations Phase 4 (December 4, 1996), Phase 4-A (February 5, 1997), Phase 4-B (May 2, 1997), Phase 4-C (June 27, 1997), Phase 4-D (June 27, 1997), D.T.E. 98-15-Phases II/III (March 19, 1999) (making UNE rates permanent), D.T.E. 98-57–Phase II (May 4, 2000) (establishing UNE-P rates), Phase 4-N (October 13, 1999), Phase 4-R (August 17, 2000) (setting dark fiber rates), and D.T.E. 98-57 (March 24, 2000) (setting EEL rates). The existing nonrecurring UNE rates are addressed in: Phase 4-L (October 14, 1999), Phase 4-O (January 10, 2000), Phase 4-S (September 15, 2000), and Phase 4-T (December 19, 2000) (regarding field dispatch charges). Collocation was addressed in Phase 4-G (June 11, 1998), Phase 4-H (July 23, 1998), and Phase 4-I (January 7, 1999).

The D.T.E. 98-57 docket also addressed: rates for interconnection services and access to UNEs in Tariff No. 17 Order (March 24, 2000), Phase I Order (September 7, 2000), and Phase I-B Order (May 24, 2001); house and riser cable in Phase II Order (May 4, 2000); and line splitting in Phase III Order (September 29, 2000), Phase III-B Letter Order (November 7, 2000), Phase III-A Reconsideration Order (January 8, 2001), and Phase III-B Clarification Order (February 21, 2001).

pursuant to the five-year cycle established in Investigation of Resale Tariff of Bell Atlantic, D.T.E. 98-15-Phases II/III (March 19, 1999).

In the Vote and Order, the Department divided the current proceeding into two parts. This Order completes Part A, for the development of new recurring and nonrecurring UNE and interconnection rates based on the Total Element Long-Run Incremental Cost ("TELRIC") method established in the Federal Communications Commission's ("FCC") Local Competition Order[2] to implement requirements of the Telecommunications Act of 1996 ("Telecom Act" or "Act").[3] Part B, for the development of a new avoided-cost discount, was subsequently held in abeyance pending establishment of new resale discount rules by the FCC.[4]

2 In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98, First Report and Order, FCC 96-325 (rel. August 8, 1996) ("Local Competition Order"). In addition, on May 24, 2002, the U.S. Court of Appeals for the D.C. Circuit remanded the FCC's order, Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket No. 96-98, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, FCC 99-238, 15 FCC Rcd 3696 (rel. November 5, 1999) ("UNE Remand Order"); and vacated and remanded its order, In the Matters of Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket No. 98-147, Third Report and Order, FCC 99-355 (rel. December 9, 1999) ("Line Sharing Order"). U.S. Telecom Ass'n., et al. v. FCC, 290 F.3d 415 (D.C. Cir. May 24, 2002). The FCC sought a rehearing of this decision on July 8, 2002. FCC Petition for Rehearing or Rehearing En Banc, 290 F.3d 415. Until the court makes a determination on rehearing or the FCC completes its remand proceedings concerning these orders, or the Department determines otherwise, the Department considers the status quo in effect (i.e., Verizon remains obligated to provide existing UNE and interconnection at rates we determine herein).

3 47 U.S.C. §§ 151 et seq. The FCC developed the TELRIC method to implement Sections 251 and 252 of the Act, which outline obligations for incumbent local exchange carriers in opening up local phone markets to competition. See also 47 C.F.R. § 51.505 (defining forward-looking economic cost).

4 On July 18, 2000, the U.S. Court of Appeals for the Eighth Circuit vacated and remanded the FCC's UNE pricing and avoided-cost discount rules on substantive

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On May 13, 2002, the United States Supreme Court upheld the FCC's TELRIC methodology as a reasonable method for setting UNE rates under the 1996 Telecom Act, reversing a decision of the Court of Appeals for the Eighth Circuit that invalidated TELRIC.[5] Verizon Communications, Inc., et al. v. FCC, et al., 122 S.Ct. 1646 (2002). Specifically, the Supreme Court stated that the incumbent local exchange carriers ("ILECs") opposing TELRIC "failed to carry their burden of showing unreasonableness [of the FCC rules] to defeat the

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grounds. Iowa Utils. Bd. v. FCC, 219 F.3d 744 (8th Cir. 2000). The decision was stayed while parties petitioned the U.S. Supreme Court for writ of certiorari. On January 22, 2001, the Court granted certiorari on the UNE pricing rules, but not the avoided-cost discount rules. Verizon Communications, Inc., et al. v. FCC, et al., 531 U.S. 1124 (2001). Consequently, on April 4, 2001, the Department granted Network Plus, Inc.'s motion to hold Part B of this proceeding in abeyance. The Department stated that, with certiorari denied on the resale discount rules, the Eighth Circuit's decision to vacate and remand the avoided-cost rule, 47 C.F.R. § 51.609, was final, and thus, holding Part B in abeyance was prudent given the uncertainty as to the FCC's forthcoming rules on remand. Interlocutory Order on Part B Motions at 12-14 (April 4, 2001). As the FCC has not issued new rules, Part B remains in abeyance.

5 The Eighth Circuit first vacated the TELRIC method on grounds that FCC exceeded its authority in adopting it. Iowa Utils. Bd. v. FCC, 120 F.3d 753 (8th Cir. 1997). The Supreme Court subsequently held that the FCC had jurisdiction to design a pricing method; reinstated the TELRIC rules on January 25, 1999; and remanded for consideration of substantive challenges to TELRIC. AT&T Corp. v. Iowa Utils. Bd., 525 U.S. 366 (1999). On remand, on July 18, 2000, the Eighth Circuit vacated and remanded the FCC's UNE pricing rules on substantive grounds. Iowa Utils. Bd. v. FCC, 219 F.3d 744 (8th Cir. 2000) (vacating 47 C.F.R. § 51.505(b)(1); affirming FCC's use of forward-looking, incremental cost approach, but finding TELRIC method violated the 1996 Act's requirement that UNE prices be based on cost of providing elements). Parties petitioned the Supreme Court for a writ of certiorari, and, on September 22, 2000, the Eighth Circuit stayed its decision. Iowa Utils. Bd. v. FCC, Docket No. 96-3321 (and consolidated cases), Decision on Motion for Partial Stay of Mandate (8th Cir. 2000). The Supreme Court granted certiorari, 531 U.S. 1124 (2001), and heard oral argument in the case on October 10, 2001. Verizon Communications Inc., et al. v. FCC, et al., Nos. 00-511, 00-555, 00-587, 00-590, 00-602 (U.S. argued Oct. 10, 2001).

deference due the Commission." Id. at 1679. The Court concluded: "TELRIC appears to be a reasonable policy for now, and that is all that counts." Id. at 1678, citing Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc., 467 U.S. 837, 866 (1984) (regarding deference due reasonable interpretation by agency).

The Department adopted the TELRIC method and approved interim prices for UNEs on December 4, 1996. Phase 4 Order. Consistent with the Supreme Court's ruling, FCC guidance, and our December 1996 Order in Phase 4 of the Consolidated Arbitrations, in making methodological decisions in this proceeding, the Department bases its determinations on the FCC's directives in the Local Competition Order on applying the TELRIC method to implement the UNE pricing requirements of the Telecom Act. The current proceeding is a comprehensive review of Verizon New England, Inc. d/b/a Verizon Massachusetts' ("Verizon") TELRIC-based rates for UNEs and interconnection (both recurring and nonrecurring, with the primary objective of assessing whether Verizon has substantiated the reasonableness of its many UNE and interconnection cost components.

2. Department Review

On February 8, 2001, the Department held a procedural conference and established a schedule for review, in Part A, of the appropriate TELRIC model and the appropriate inputs to that model. Additionally, the Department granted the motions to intervene of Verizon[6]; AT&T Communications of New England, Inc. ("AT&T"); the Attorney General of the

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[6] On June 30, 2000, upon merger of Bell Atlantic Corporation and GTE Corporation, the entity formerly known as Bell Atlantic-Massachusetts (formerly NYNEX), began operating in Massachusetts as Verizon New England, Inc. In references to Orders and events prior to the merger, for convenience's sake, the Department will herein refer to the company as Verizon.

Commonwealth of Massachusetts ("Attorney General"); Brahmacom, Inc., Essential.com, Inc., Norfolk County Internet, Inc., and Servisense, Inc.; Conversent Communications of Massachusetts, LLC; FairPoint Communications Solutions Corporation; Freedom Ring Communications d/b/a Bay Ring Communications, the Association of Communications Enterprises, and XO Massachusetts, Inc. ("XO"); Global NAPs, Inc.; PaeTec Communications, Inc.; RNK Inc. d/b/a RNK Telecom; Sprint Communications Company L.P. ("Sprint"); United States Department of Defense and All Other Federal Executive Agencies ("DOD/FEA" or "DOD"); WorldCom, Inc. ("WorldCom"); Z-Tel Communications, Inc. ("Z-Tel"); Allegiance Telecom of Massachusetts, Inc. ("Allegiance Telecom"); Covad Communications Company ("Covad"); El Paso Networks, LLC; and Network Plus, Inc. The Department granted limited participant status to: Adelphia Business Solutions; New England Cable Television Association, Inc.; and Network Access Solutions Corporation.

On May 8, 2001, Verizon and AT&T filed direct cases in Part A, consisting of their respective proposed cost models, model inputs, proposed rates, direct testimony, and supporting documentation. An open discovery period was held from May 8 through August 8, 2001, during which time the parties and the Department issued more than 1,000 discovery requests. Technical sessions were held on June 4 and 5, 2001. Verizon, AT&T, DOD/FEA, Z-Tel, Sprint, individually, and Covad, Allegiance Telecom, El Paso Networks, and Network Plus, collectively ("CLEC Coalition") filed rebuttal testimony on July 18, 2001. Sprint withdrew its testimony on October 22, 2001. Verizon, AT&T, and DOD filed surrebuttal testimony on December 17, 2001.

In the pre-hearing stage, parties filed numerous motions, including motions to compel discovery responses and to strike testimony. The Hearing Officers issued rulings on April 30, May 18, June 13, August 8, August 31, and December 21, 2001, and on January 4 and February 25, 2002.[7] Additionally, the Department issued Interlocutory Orders on February 22, April 4, June 12, August 31 and October 18, 2001.[8]

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[7] Ruling Granting Verizon Motion for Extension of Filing Date (April 30, 2001); Ruling on Motion by CLEC Coalition to Strike Verizon Testimony and for Extension of Time to File Rebuttal Testimony (May 18, 2001) (denying motion to strike Verizon cost studies and testimony on collocation, xDSL and line sharing/splitting; granting extension for filing rebuttal testimony); Ruling Granting Motion by CLEC Coalition for Extension of Rebuttal Testimony Filing Date (June 13, 2001); Ruling on Verizon Motion to Compel Discovery Responses by AT&T and CLEC Coalition Motion to Compel Discovery Responses by Verizon (August 8, 2001) (granting in part and denying in part Verizon motion; granting CLEC Coalition motion); Ruling Granting Verizon Motion to Extend Procedural Schedule (August 31, 2001); Ruling on Motions for Confidential Treatment by Verizon (December 21, 2001) (granting in part and denying in part Verizon's October 29 and November 26, 2001 motions); Ruling on Motion to Strike Testimony Filed by Verizon (January 4, 2002) (denying motion to strike portions of rebuttal testimony of CLEC Coalition witness Mark L. Stacy); Ruling re: Overdue Record Request Responses (February 25, 2002) (directing parties to file certain overdue responses).

[8] Interlocutory Order on Appeal by Verizon of Hearing Officer's Ruling on the Procedural Schedule (February 22, 2001); Interlocutory Order on Part B Motions (April 4, 2001) ("Interlocutory Order on Part B Motions"); Interlocutory Order on CLEC Coalition's Appeal of Hearing Officers' May 18, 2001 Ruling (June 12, 2001) (affirming denial of motion to strike regarding collocation, xDSL and line sharing/line splitting issues); Interlocutory Order on Verizon's Appeal of Hearing Officer's August 8, 2001 Ruling on Motions to Compel (August 31, 2001) (granting appeal and ordering AT&T to produce further information request responses; denying AT&T cross-motion to strike Verizon cost model) ("August 31 Interlocutory Order"); Interlocutory Order on AT&T's Motion for Relief, Motions to Compel Verizon Responses to AT&T Information Requests, and Conditional Motion to Strike Verizon's Recurring Cost Model (October 18, 2001) (granting relief from August 31 Order to produce response to VZ-ATT 1-23 and request to provide electronic access; granting Motion to Compel a number of Verizon responses; denying Motion to Compel response to ATT-VZ 5-6; denying Conditional Motion to Strike Verizon's recurring cost model) ("October 18 Interlocutory Order").

The Department conducted 18 days of evidentiary hearings between January 7 and February 15, 2002. At the February 7 hearing, the Hearing Officers granted parties' unopposed[9] pre-hearing motions for confidential treatment (Tr. 17, at 3534-3535). Pre-filed testimony and exhibits of Verizon, AT&T, the CLEC Coalition, the DOD, Z-Tel, and the Department, plus all responses to Information Requests, were admitted into evidence at the conclusion of the hearings (Tr. 18, at 3551-3556).[10] The evidentiary record also includes one hundred Department Record Requests;[11] a dozen requests by Verizon, AT&T, and the Attorney General; and certain exhibits and testimony from D.T.E. 98-57-Phase III (regarding digital subscriber line ("xDSL") and line sharing-related issues).[12]

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9 Verizon filed three motions; AT&T, seven; and Covad, one. AT&T partially opposed Verizon's October 29 and November 26, 2001 motions for confidential treatment, the subject of the Hearing Officers' Ruling on Motions for Confidential Treatment (December 21, 2001).

10 The Department admitted its Exhibits DTE-1 through DTE-9; AT&T Exhibits ATT-1 through ATT-25; CLEC Coalition Exhibits CC-1 through CC-7 and CC-9 through CC-14; Exhs. DOD-1 and DOD-2; Exh. Z-Tel-1; and Verizon Exhibits VZ-1 through VZ-59, with the exception of Exh. VZ-10, Exh. VZ-32-P, Exh. VZ-33-P, and Exh. VZ-48-P (Tr. 18, at 3551-3556). Exhibits containing proprietary materials are designated herein with "-P"; supplemental responses to information or record requests are designated with "-S" and further supplements as "-2S," etc.

11 The Department later withdrew RR-DTE-88.

12 On January 22, 2002, Covad filed a Motion to Incorporate Evidence, pursuant to 220 C.M.R. § 1.10(3), from D.T.E. 98-57-Phase III on the following issues: Recurring and Nonrecurring Rates Associated with the Loop (recurring rate for line sharing loop, retroactive OSS charge, service order charge, service connection charge and cross-connection service activation charge); Loop Qualification Charges (mechanized and manual); Loop Conditioning Charges; Recurring and Nonrecurring Rates Associated with Cable Augment (POT Bay splitter termination charge, service access connection/tie cable charge, splitter equipment support charge, maintenance of splitter charge/splitter administration and support charge, application-augment and engineering and implementation fees, splitter installation, and service connection charge);

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Verizon, AT&T, WorldCom, the CLEC Coalition, DOD/FEA, XO, and the Attorney General filed Initial Briefs on March 5, 2002. Verizon, AT&T, WorldCom, the CLEC Coalition, DOD/FEA, and Z-Tel filed Reply Briefs on March 29, 2002. Subsequent to the evidentiary hearings, the parties filed various motions. WorldCom, AT&T, and Verizon filed motions for confidential treatment on February 22, April 22, and April 24, 2002, respectively.[13] Also, AT&T filed two motions to strike, on March 22 and April 10, 2002. First, AT&T moved to strike statements in Verizon's initial brief that relied on Exhibit VZ-48, which was excluded from the evidentiary record.[14] Second, AT&T moved to strike Verizon's

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Cooperative Testing Charge; as well as "nonrecurring charges in general."

On February 6, 2002, Verizon responded with a separate Motion to Incorporate by Reference and to File Supplemental Testimony seeking to incorporate additional portions of the Phase III record on the issues Covad identified. The Department granted the incorporation motions but denied Verizon's motion to allow supplemental testimony (see Tr. 18, at 3556-3562).

13 WorldCom requested confidential treatment for the attachment to its response to RR-VZ-1. AT&T requested protective treatment for attachments to its responses to RR-DTE-46, RR-VZ-2 and 2S, and RR-VZ-3. Verizon requested confidential treatment for responses to 22 Department Record Requests (numbers 11, 18, 19, 27, 29, 30, 37, 47, 49S, 50, 50S, 52, 56, 63, 63S, 65, 66, 67, 69, 71, 96, and 97); RR-ATT-3, RR-AG-1, and RR-AG-2; and Exh. WCom-VZ 2-1S. Having reviewed the materials described, the Department finds that the parties have demonstrated, as required by G.L. c. 25, § 5D, that they should be protected from public disclosure. However, we determine that the possibility of competitive harm resulting from disclosure of "stale" information is significantly reduced, and, thus, we conclude that the information we have agreed to protect here will not require such protection in perpetuity. Therefore, such protection will extend for two years from the date of this Order. At that time, the parties may move the Department to further extend such protection accompanied by adequate proof of the need to do so; otherwise the limited protection we grant today will cease at that time.

14 AT&T moved that the Department strike sentences from Verizon's Brief at page 165 that relied on Exh. VZ-48, which was not admitted into evidence. Verizon responded

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proposed "AC [alternating current] Amps per DC [direct current] Amps" rate contained in its initial and errata replies to RR-DTE-40 or, in the alternative, to reopen the record ("Motion to Strike re: RR-DTE-40"), to which Verizon replied on April 24, 2002. The Department finds that, contrary to AT&T's assertion, Verizon's response to RR-DTE-40 and its subsequent errata reply are within the scope of the Department's record request (see Tr. 7, at 1208),[15] and we hereby deny the motion to strike on procedural grounds. Further, finding no cause to reopen the evidentiary record, we likewise deny AT&T's alternative motion.[16]

B. Summary of Cost Studies and Testimony

Verizon's May 8, 2001 direct case filing consists of a three-volume TELRIC cost study (Exh. VZ-37) for UNEs with the following subparts: Part A - Results; Part B - Local Loop, including, among other things, network interface device ("NID"), house and riser cable

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on March 27, 2002 that it did not object to removing the final sentence in footnote 149. The Department therefore grants AT&T's motion to strike that sentence. With regard to the sentence in the text, Verizon argued that the Department should strike only the citation, not the sentence, which Verizon stated was "argument." The Department agrees, and hereby grants AT&T's motion to strike with regard to the citation only.

15 The Department requested that Verizon provide an explanation for the proposed AC amps per DC amps rate in its response, and the information provided reasonably complied with that request. In addition to arguing that Verizon's response was procedurally improper, AT&T argued that the Department should strike the response because Verizon's proposed rate "purports to recover costs for which there is no record evidence" and "'recovers' more than the costs to which Verizon claims it is entitled" (Motion to Strike re: RR-DTE-40, at 1). Because we decline to strike the response as beyond the scope of the record request, we consider the merit of the response to RR-DTE-40 along with the other evidence pertaining to Verizon's power consumption cost study in Section IX.E.3, below.

16 Given our findings in Section IX.E.3, we find no "good cause" to reopen the record as required by 220 C.M.R. § 1.11(8).

("HARC"), xDSL, enhanced extended links ("EELs") and, line sharing and line splitting; Part C – Switching, including reciprocal compensation; Part D – Interoffice Transport; Part E – Signaling Systems and Databases; Part F – Unbundled Dark Fiber, including daily usage file ("DUF"); Part G – Factors, including, among other things, common overhead study and right to use ("RTU") factor study; and Part I – Nonrecurring Cost Model ("NRCM") (Verizon did not submit a "Part H" to its cost study). Verizon's direct case also includes proposed collocation and Operations Support Systems ("OSS") cost studies and pre-filed direct testimony. Along with rebuttal testimony, Verizon modified and re-filed its Nonrecurring Cost ("NRC") Study. Verizon's NRCM, Loop Cost Analysis Model ("LCAM"), and Switching System Cost Information System ("SCIS") model are in electronic form. These models are addressed in detail in Sections IV (Cost Models), VII (Switching) and X (Nonrecurring Costs) ("NRCs"), below.

AT&T's direct case includes an electronic version of the HAI 5.2a-MA Model ("Hatfield Model," "HAI" or "HAI 5.2a-MA"), an alternative recurring cost study, along with voluminous supporting documentation, including a history of the HAI model; detailed explanations of inputs, assumptions, and default values; and a user manual. Additionally, AT&T provided Verizon and the Department with access to the third-party geocoded database (intellectual property of TNS Telecoms, a third-party vendor) that the HAI Model uses in order to determine customer locations and clustering. AT&T also submitted a proposed HAI Adjunct Model, producing costs for DS1 and xDSL-related network components, and a proposed electronic NRC model. The models AT&T sponsored are discussed in Section IV, below.

Verizon, AT&T and WorldCom, the CLEC Coalition, and the DOD sponsored witnesses at the evidentiary hearings. Verizon's witnesses included: William Taylor, Senior Vice President of National Economic Research Associates, Inc. ("NERA"), on the topic of TELRIC; James Vander Weide, President of Financial Strategy Associates consulting firm and Professor of Finance and Economics at Duke University (cost of capital); Allen E. Sovereign, Verizon Group Manager-Capital Recovery and John M. Lacey, Professor of Accountancy and Ernst & Young Research Fellow at California State University (depreciation); Louis D. Minion, Manager-Service Costs, Verizon Finance (OSS costs); and Dinell Clark, Staff Director, Verizon Service Cost organization (collocation). Verizon's Recurring Cost Model Panel comprised: Michael J. Anglin, Director of Support, Verizon Service Cost; John G. Livecchi, Director, FCC and Regulatory Support for Verizon's Outside Plant Engineering organization; Nancy Matt, a manager in the Service Cost organization; Joseph Gansert, Verizon Director-Technical and Cost, Regulatory Support; and David J. Garfield of Telcordia Technologies Business Decision Support. Members of Verizon's Nonrecurring Costs and xDSL Panel were Bruce F. Meacham, Senior Specialist, Verizon Finance Department (Service Costs organization), Michael Peduto, Verizon Director-Program Management, John L. White, Executive Director, Verizon Wholesale Services, and Eugene J. Goldrick, statistician, Verizon Service Cost. Panelists Timothy J. Tardiff, a Vice President at NERA, Christian M. Dippon, a Senior Consultant at NERA, and Mr. Gansert analyzed AT&T's HAI Model.

AT&T presented Robert A. Mercer, Principal of BroadView Telecommunications, LLC consulting firm, as a panelist on the HAI Model, and, on horizontal cable and line sharing/splitting: William D. Salvatore, AT&T District Manager-Regulatory Affairs. AT&T

and WorldCom jointly presented:[17] John I. Hirshleifer, Vice President at Charles River Associates, Inc., financial and economic consulting firm (cost of capital); Richard B. Lee, Vice President, Snavely King Majoros O'Connor and Lee, Inc. economic consulting firm (depreciation); Steven E. Turner, head of telecommunications and financial consulting firm Kaleo Consulting (interoffice transport, common (shared) transport, and collocation); Richard J. Walsh, AT&T consultant in the Local Services and Access Management/Local Connectivity Cost, Price and Planning Division (NRCs); Michael R. Baranowski, Managing Director of FTI/Klick, Kent & Allen, Inc., subsidiary of FTI Consulting, Inc. (loops and OSS costs); and Catherine E. Pitts, independent contractor for AT&T on switch costs (switching). John C. Donovan, President of Telecom Visions, Inc. consulting services, testified with Robert Mercer as a panelist on the HAI Model.

Witnesses for the CLEC Coalition, from Quantitative Solutions, Inc., a consulting firm specializing in economics and telecommunications, were: Senior Vice President August H. Ankum (Verizon's cost models, UNE costing and pricing, TELRIC, collocation and reciprocal compensation) and Senior Consultants Mark Stacy (NRCs), Warren Fischer (annual cost factors) ("ACFs"), and Sidney Morrison (collocation). Harry Gildea, Senior Consultant for Snavely King Majoros O'Connor & Lee, Inc., testified for the DOD on Verizon and AT&T's cost models, capital structure, and HARC. Z-Tel presented George S. Ford, its Chief

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[17] Mr. Hirshleifer and Mr. Lee submitted direct testimony on behalf of AT&T only. WorldCom jointly sponsored their rebuttal, surrebuttal and hearing testimony. Mr. Walsh and Mr. Donovan submitted direct testimony on behalf of AT&T only, in support of AT&T's cost studies. Both submitted further testimony in support of AT&T's cost studies, as well as testimony critiquing Verizon cost studies. WorldCom co-sponsored their rebuttal, surrebuttal, and hearing testimony to the extent that it dealt with Verizon's cost studies.

Economist, on Verizon's recurring cost model. Because neither the Department nor any of the parties had cross-examination for Mr. Ford, his testimony was admitted into evidence pursuant to an affidavit.

II. STANDARD OF REVIEW

In the Local Competition Order, the FCC established the TELRIC method to set prices of UNEs interconnection and access to unbundled elements based on forward-looking, economic costs that best replicate the conditions of a competitive market. Specifically, the Local Competition Order adopted initial rules designed to implement Sections 251 and 252 of the Telecom Act, which outline certain obligations for ILECs in opening local phone markets to competition.[18]

Section 251 requires ILECs to provide competitive local exchange carriers ("CLECs"):

> nondiscriminatory access to network elements on an unbundled basis at any technically feasible point on rates, terms and conditions that are just, reasonable and nondiscriminatory in accordance with the terms and conditions of the agreement and the requirements of this section and section 252. An incumbent local exchange carrier shall provide such unbundled network elements in a manner that allows requesting carriers to combine such elements in order to provide such telecommunications service.

47 U.S.C. § 251(c)(3).

Section 252 provides that determination by a state commission of the just and reasonable rate for the interconnection of facilities and equipment and for network elements:

> (A) shall be –
> (i) based on the cost (determined without rate-of-return or other rate based proceeding) of providing the interconnection or network element . . . and,
> (ii) nondiscriminatory, and

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18 The ILEC is obligated to provide interconnection, unbundled access, resale, notice of changes, and collocation. 47 U.S.C. § 251(c).

(B) may include a reasonable profit.

47 U.S.C. § 252(d)(1).

The FCC stated that its forward-looking, cost-based pricing methodology, by establishing prices for UNEs and interconnection based on costs similar to those incurred by incumbents, would reduce the ability of incumbent LECs to engage in anti-competitive behavior and facilitate competition on "a reasonable and efficient basis." Local Competition Order at ¶ 679.

The FCC further stated that it was "establishing pricing rules that should produce rates for monopoly elements and services that approximate what the incumbent LECs would be able to charge if there were a competitive market for such offerings." Id. at ¶ 738. The agency expanded on this to indicate that, "under a TELRIC methodology, incumbent LECs' prices for interconnection and unbundled network elements shall recover the forward-looking costs directly attributable to the specified element, as well as reasonable allocation of forward-looking common costs." Id. at ¶ 682. With respect to the configuration of the telecommunications network that should be assumed by state commissions, the FCC stated that the pricing methodology "should be based on costs that assume that wire centers[19] will be placed at the incumbent LEC's current wire center locations, but that the reconstructed local network will employ the most efficient technology for reasonably foreseeable capacity requirements." Id. at ¶ 685.

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19 A wire center is "[t]he physical structure where the telephone company terminates outside cable plant." Newton's Telecom Dictionary, 17th ed. at 771 (2001).

Finally, the FCC stated that the ILEC – in this case Verizon – has the burden of proof with regard to calculation of the TELRIC of UNEs, noting that ILECs have greater access to the cost information needed for such a study. Phase 4 Order at 8, citing Local Competition Order at ¶ 680. AT&T and WorldCom have proposed alternative TELRIC studies, the Hatfield Model version HAI 5.2a-MA and an alternative NRC model. If Verizon has not met its burden of proof with regard to its TELRIC model, we could employ the HAI Model, if we determine it meets the FCC's requirements. Id. at 9.

III. ECONOMIC ISSUES

A. Introduction

Parties in this proceeding agree, and the U.S. Supreme Court has affirmed, that the appropriate standard for the Department to use in setting UNE rates is the FCC's TELRIC method (see, e.g., Verizon Brief at 2, AT&T Brief at 4). See generally Verizon Communications, Inc. v. FCC, 122 S.Ct. 1646. There is disagreement, however, about just what that standard requires.

B. Positions of the Parties

1. Verizon

According to Verizon, its TELRIC model "assumes that the existing network is replaced with one that uses a forward-looking technology mix network-wide, despite the fact that such a mix will not be deployed network-wide for the foreseeable future," and, at the same time, its cost studies "are tethered to reality, reflecting (within the constraints of TELRIC) informed, realistic and cost-minimizing decisions regarding a forward-looking network, taking into account the technological and demand uncertainties inherent in providing telecommunications services, particularly in a forward-looking competitive environment" (Verizon Brief at 3). Verizon states that its studies are driven by judgments and assessments of Verizon engineers and cost analysts and "grounded in their experience operating a real local exchange network" (id.).

Verizon asserts that its cost model also accounts for "some of the risks and uncertainties that play an essential role in telecommunications investment decisions and costs" (id.). Verizon contends that the existing competitive risks and uncertainties associated with the regulatory regime include Verizon's obligation to lease parts of its network to CLECs at prices that are less than the costs of providing them, though CLECs may abandon those facilities at any time, leaving Verizon with "stranded investment" (id., citing Exh. VZ-55, at 12 n.8; Phase 4 Order at 38-47).

Verizon states that its TELRIC studies "are designed to comply with the most economically appropriate interpretations of TELRIC . . . rooted in the rational choices that Verizon MA, acting efficiently over the long run, would make going forward" (id. at 7). Accordingly, Verizon asserts, its studies estimate the costs Verizon would incur if it "expanded and replaced its entire network over time," using "the technology mix that would be deployed on a going-forward basis when it incrementally builds new facilities or replaces existing ones" (id. at 9-10).

Verizon acknowledges that its cost model incorporates some existing network characteristics and facilities, but argues that "so long as that facility or characteristic is the product of efficient investment in and operation of the network going forward, modeling its costs is entirely consistent with a forward-looking approach" (id. at 12). Verizon contends that "long-run cost optimization does not mean replacing all existing facilities with new facilities whenever new technology becomes available, even if such replacement might produce lower short-run costs in a hypothetical static world" (id. at 14).

Meanwhile, Verizon criticizes AT&T's proposed HAI model as understating costs "beyond the realm of credulity" (id. at 4). Verizon characterizes the HAI model as "an imprecise, results-driven costing tool, characterized by unsubstantiated engineering assumptions and inaccurate estimating methodologies" (id.). Verizon contends that "AT&T's cost methodology is based on an idealized, scorched-node[20] network that is instantaneously and successively rebuilt from scratch every few years and that takes a static view of technology and demand so as not to have to account for the inevitable uncertainties resulting from those variables" (id. at 5-6) (footnote added).

With regard to inputs, Verizon claims that AT&T inconsistently applies certain assumptions and approaches (id. at 6). For example, Verizon contends, AT&T's general approach is to assume a "hyper-competitive market in which new entrants can instantaneously enter with ubiquitous networks"; yet, when calculating the cost of capital and depreciation lives, it assumes a monopoly environment (id.).

According to Verizon, AT&T distorts the concept of "long run" in requiring the incumbent "to assume away all of its existing network and pretend it is building from scratch" (id. at 15). Verizon asserts that the three-year planning period it uses in its TELRIC cost

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20 Under a "scorched-node" methodology, the cost of UNEs is measured based on the use of the most efficient telecommunications technology currently available and the lowest cost network configuration, given the location of the incumbent LEC's wire centers. See 47 C.F.R. § 51.505(b)(1); Local Competition Order at ¶¶ 683-685.

studies is a reasonable time period for making predictions concerning technological and demand changes (id.). Verizon adds that its cost studies "are informed by real data concerning the network and real experience in operating the network" (id. at 22).

Verizon contends that prices based on its TELRIC model "will send far more appropriate and realistic economic signals to CLECs concerning when to rely on UNEs and when to invest in their own facilities than the model proposed by AT&T" (id. at 7). Verizon maintains that its approach will promote facilities-based competition, which, according to Verizon, "is the preferred mode of entry and the one most likely to serve Massachusetts consumers' needs for diverse, redundant services and networks" (id. at 7-8).

2. AT&T

AT&T asserts that "correct rates" are TELRIC-compliant and low enough to foster local exchange competition (AT&T Brief at 2). "UNE rates should not be biased upward in the belief that doing so would promote facilities-based competition," AT&T contends (id. at 3).

In defining its view of TELRIC, AT&T cites FCC UNE pricing rules and requirements, noting that the FCC has decided against both a "scorched earth" and embedded cost method in favor of a "scorched node" methodology, under which the cost of UNEs is "measured based on the use of the most efficient telecommunications technology currently available and the lowest cost network configuration, given the location of the incumbent LEC's wire centers" (id. at 5-6, citing 47 C.F.R. § 51.505(b)(1) and Local Competition Order at ¶¶ 683-685). AT&T further cites the FCC's statement that the "long run" in TELRIC means a period long enough that all costs are treated as variable and avoidable (id. at 7, citing Local Competition Order at ¶ 692).

AT&T argues that any doubt as to any aspect of the forward-looking economic costs Verizon will recover "must be resolved in favor of lower UNE rates, especially given Verizon's burden of proof, the period of time these rates are likely to be in effect, and that telecommunications is a declining cost industry" (id. at 8).

3. WorldCom

WorldCom contends that a TELRIC-compliant study "is designed to measure the forward-looking incremental costs an efficient carrier would incur in serving the total demand for UNEs with the most efficient technology available" and that the only limitation on the configuration of a TELRIC-compliant network "is that it must use the existing wire center locations of the incumbent local exchange carrier" (WorldCom Brief at 6).

WorldCom criticizes Verizon's studies, arguing that Verizon's models and inputs are not designed to measure costs anticipated over the long run, "but over the next several years – a short-run period in which costs are severely constrained by the configuration of its existing network" (id.). WorldCom further argues that, "critically, Verizon's cost studies do not reflect efficient network design, but instead model Verizon's existing network design" (id.) (emphasis in original). According to WorldCom, Verizon "is not advocating an 'economically correct' interpretation of the FCC's TELRIC rules; instead, it is unilaterally rewriting them" (id. at 7).

C. Analysis and Findings

The Department's objective in this Order is to set UNE rates that most accurately reflect the TELRIC costs of particular UNEs. It is not to reach a biased outcome promoting either investment or UNE-based competition through either "high" or "low" UNE rates. Incremental cost-based rates, designed and implemented correctly, send the appropriate signals to both ILECs and CLECs about their investment and market entry decisions. We will not conclude that UNE rates are "wrong" or "illegal" if they do not provide a sufficient margin for market entry when compared to retail rates (which are not cost-based).[21] Nor will we conclude that rates are wrong if CLECs decide that it is more efficient for them to enter the market using UNEs instead of building their own facilities. In addition, appropriately cost-based rates should compensate Verizon for its forward-looking costs, so that Verizon will have incentives to continue to invest in its network facilities.

As noted above, it is undisputed in this proceeding that the proper method for setting UNE rates is the FCC's TELRIC methodology. AT&T and WorldCom correctly observe that some of Verizon's arguments and interpretations represent Verizon's view of what Verizon wants TELRIC to be, rather than the FCC's requirements or guidance (WorldCom Brief at 6-

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21 The Department noted in its May 8, 2002 Order regarding an alternative regulation plan for Verizon that if Verizon's retail rates do not recover both imputed UNE costs and Verizon's retail costs, they will be adjusted to make them cost-based and thus allow for competition. The answer to problems with margins must come from the retail side of the equation when wholesale rates are found to be cost-based. See Investigation by the Department of Telecommunications and Energy on its own Motion into the Appropriate Regulatory Plan to succeed Price Cap Regulation for Verizon New England, Inc. d/b/a Verizon Massachusetts' intrastate retail telecommunications services in the Commonwealth of Massachusetts, D.T.E. 01-31-Phase I at 90-91 (2002).

7; AT&T Brief at 6-7). For example, Verizon criticizes the “scorched node” and “dropped in place” characteristics of a network modeled under TELRIC, but those characteristics are part of the FCC’s description of its TELRIC method.[22] In this Order, the Department is guided by the FCC’s rules and statements about what constitutes TELRIC.[23]

As we noted in Consolidated Arbitrations, the FCC states the following rationale for the TELRIC model:

> Adopting a pricing methodology based on forward-looking, economic costs best replicates, to the extent possible, the conditions of a competitive market. In

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22 Whether or not AT&T’s and WorldCom’s proposals for cost of capital and depreciation are inconsistent with these characteristics of a TELRIC model, as Verizon contends, will be taken up in the sections of this Order dealing with those inputs. See Sections V.A (Cost of Capital) and V.B (Depreciation), below.

23 The FCC’s TELRIC guidance comes from the Local Competition Order and its many orders on applications for Section 271 authority. “Section 271” or “271” application refers to an application for authority to provide in-region, interLATA service pursuant to 47 U.S.C. § 271. In addition, In the Matter of Federal-State Joint Board, CC Docket No. 96-45, and Forward-Looking Mechanism for High Cost Support for Non-Rural LECs, CC Docket No. 97-160, Tenth Report and Order, FCC 99-304 (rel. November 2, 1999) (“Inputs Order”) provides some guidance on cost model principles and is instructive for some inputs, although we do not include the Inputs Order as FCC precedent on what constitutes TELRIC. The FCC has many times cautioned parties that the cost model it used in the Inputs Order was developed specifically for universal service. The federal universal service proceeding considered comparative cost differences of the states rather than actual costs of providing service, and the FCC stated that it did not consider

> [W]hat type of input values, company-specific or nationwide, nor what specific input values, would be appropriate for any other purposes. The federal cost model was developed for the purpose of determining federal universal service support, and it may not be appropriate to use nationwide values for other purposes, such as determining prices for unbundled network elements. We caution parties from making any claims in other proceedings based upon the input values we adopt in this Order.

Inputs Order at ¶¶ 30-32.

> addition, a forward-looking cost methodology reduces the ability of an incumbent LEC to engage in anti-competitive behavior. Congress recognized in the 1996 Act that access to the incumbent LECs' bottleneck facilities is critical to making meaningful competition possible. As a result of the availability to competitors of the incumbent LEC's unbundled elements at their economic cost, consumers will be able to reap the benefits of the incumbent LECs' economies of scale and scope, as well as the benefits of competition. Because a pricing methodology based on forward-looking costs simulates the conditions in a competitive marketplace, it allows the requesting carrier to produce efficiently and to compete effectively, which should drive retail prices to their competitive levels. We believe that our adoption of a forward-looking cost-based pricing methodology should facilitate competition on a reasonable and efficient basis by all firms in the industry in establishing prices for interconnection and unbundled network elements based on costs similar to those incurred by the incumbents, which may be expected to reduce the regulatory burdens and economic impact of our decisions for many parties, including both small entities seeking to enter the local exchange market and small incumbent LECs.

Phase 4 Order at 7, citing Local Competition Order at ¶ 679.

Pursuant to the FCC's requirements, a TELRIC-compliant cost study measures the "forward-looking cost over the long run of the total quantity of the facilities and functions that are directly attributable, or reasonably identifiable as incremental to, such element, calculated taking as a given the incumbent LEC's provision of other elements." 47 C.F.R. § 51.505(b). The FCC also requires that the TELRIC of UNEs "be measured based on the use of the most efficient telecommunications technology currently available and the lowest cost network configuration, given the existing location of the incumbent LEC's wire centers." Id. This is the so-called "scorched-node" or "dropped in place" approach to network design, to which the Department referred in the Consolidated Arbitrations. See Phase 4 Order at 31. In this Order, the Department will attempt to estimate the costs of a new network "dropped in place" to serve current demand and reasonably foreseeable capacity requirements, using the most efficient network technology that is currently being deployed by incumbent local exchange carriers in their current wire centers. Local Competition Order at ¶ 685.

TELRIC is not a measurement of embedded costs, but that does not mean that all evidence based on current technology or practices is excluded in a TELRIC analysis. To the extent we conclude that current technology or practices represent efficient practices that would be replicated by Verizon in reconstructing its network, that technology or practice is sound evidence to be used in a TELRIC analysis. Similarly, the Department does not take the FCC's "scorched node" approach to mean that we must assume an entirely new network topography or new wire center buildings. As we found in the Consolidated Arbitrations:

> The FCC states that we should use 'a reconstructed local network [that] will employ the most efficient technology for reasonable foreseeable capacity requirements.' Local Competition Order at ¶ 685. We interpret that sentence to refer to the technology, not to the geographic distribution of that technology. We believe that the FCC, in requiring that existing wire centers remain unchanged, was trying to rationalize a forward-looking technology approach to costing with the reality of the physical distribution of existing customers and central offices.

Phase 4 Order at 14. Otherwise, if we were modeling a new network topography, we would have to also include in a TELRIC cost study the significant costs of new buildings, poles and conduits, and rights-of-way.

While the Department will rely on its earlier findings in Consolidated Arbitrations about what constitutes TELRIC, additional guidance from the FCC about TELRIC since 1996, as well as the parties' and the Department's actual experience since that time, may lead us to develop our precedent in view of the issues presented here. Any such development of precedent will be thoroughly explained.[24]

Even so, the Department will not make findings on any issue based solely on the fact that another state (or any number of other states) made a similar finding, however useful or instructive other states' actions may be. Nor will the Department base any finding merely on the fact that the FCC made a similar finding in its Inputs Order. The Department may rely on the analysis or reasoning used by other state commissions and the FCC in its Inputs Order, and may make similar findings based on the persuasiveness of that analysis or reasoning. In other words, any reliance on outcomes from other states or the FCC will be based on the reasoning that led to the outcome, but not on the outcome itself.[25]

As the ILEC in this case, Verizon has the burden of proof with regard to the calculation of incremental costs of UNEs, because, as the FCC reasoned, incumbent carriers have greater access to the cost information needed for such a study. See Local Competition Order at ¶ 680. Nevertheless, where a Verizon opponent has presented an alternative proposal it asserts to be

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24 Parties in administrative proceedings are entitled to "reasoned consistency" in agency decision making; thus a state agency may not refuse to admit evidence of a kind permitted in previous proceedings without articulating an objective reason. Massachusetts Automobile Rating & Accident Prevention Bureau v. Commissioner of Insurance, 401 Mass. 282, 287 (1987); Boston Gas Co. v. Dept. of Public Utils., 367 Mass. 92, 104 ("[a] party to a proceeding before a regulatory agency such as the Department has a right to expect and obtain reasoned consistency in the agency's decisions").

25 The Department "ordinarily place[s] little weight on the decisions reached in other states, since we rely for our decisions on the record presented here." Phase 4 Order at 23.

TELRIC-compliant, that party has the burden of proof with regard to its own affirmative case.[26]

In some instances in this Order, the Department is not persuaded by Verizon's arguments, but neither do we find its opponents' proposals to represent TELRIC costs accurately. Moreover, a finding that any Verizon proposal is unreasonable or unsupported does not, per se, make a competitor's position reasonable or supported. When faced with opposing proposals, neither of which is persuasive or adequately supported in the evidentiary record, rather than simply adopt intervenor proposals that we believe to be inaccurate, the Department will exercise its expert judgment to reach a reasonable solution, based on our analysis of record evidence. This level of subjectivity is an inherent feature of a forward-looking cost study, wherein we are required to make best efforts to predict the future, rather than using an historic test year supplemented by known and measurable cost changes, as in a traditional embedded cost-of-service analysis. For example, in our Consolidated Arbitrations proceeding, we recognized that the costs of debt assumed by Verizon (then NYNEX) and AT&T were based on different yields to maturity, but were nevertheless very close. Phase 4 Order at 52. Instead of outlining the methodological differences between, and the contending assumptions underlying, the two estimates and determining which method was superior, the

26 As noted in the Consolidated Arbitrations, the Department had an alternative model to consider "[if] we determine that [Verizon] has not met its burden of proof with regard to the efficacy of its TELRIC model." Phase 4 Order at 9. The Department stated that it could "employ the Hatfield Model as a replacement, if we determine that it meets the FCC's requirements" and its sponsors met "their burden of proving that it is an appropriate model to develop TELRIC costs." Id. at 9, 23.

Department averaged the two and determined the resulting percentage was an acceptable cost of debt for use in the TELRIC studies. Id.

This level of subjectivity has been recognized by the United States Court of Appeals for the District of Columbia Circuit ("D.C. Circuit Court") as an inherent and essential feature of TELRIC analyses by state commissions. In a proceeding before the Kansas Commission involving UNE rates, the Kansas Commission was faced with what it deemed unrealistic proposals from both the ILEC and long distance providers involving the fall-out rate. After lengthy proceedings to reach a solution on this issue, the Kansas Commission set NRCs based on "its best judgment," and, in the words of the D.C. Circuit Court, the Kansas Commission "split the baby" by adopting a weighted average of proposals. See Joint Application of SBC Communications, Inc., et al. for Provision of In-Region, InterLATA Services in Kansas and Oklahoma, CC Docket No. 00-217, Memorandum Opinion and Order, FCC 01-29, at ¶¶ 49-51 (rel. January 22, 2001) ("Kansas/Oklahoma 271 Order"). The FCC then approved the Kansas Commission's compromise resolution, finding that the NRCs were within a reasonable range of what TELRIC might produce. Id. at ¶¶ 59-60. On appeal, the D.C. Circuit Court upheld the FCC's decision, noting that "[g]iven that calculation of forward-looking costs for a hypothetical network requires far more use of predictive judgments than does standard cost-of-service ratemaking, some such allocation was likely essential" and refused to "fault the FCC for approving the Kansas Commission's compromise resolution of an issue that the parties' behavior had left a muddle." Sprint Communications Co. v. FCC, 274 F. 3d 549, 558, 559 (D.C. Cir. 2001). In the end, an agency must assess the record before it and endeavor to be as clear about why it chose the outcome it did for each material issue, recognizing that, when all is said and done, the TELRIC method, as prescribed by statute, implemented by FCC regulation, and sanctioned by the Supreme Court, requires saying what the future may be like for actors in a competitive and technologically dynamic marketplace. The level of evidentiary uncertainty inherent in TELRIC is far greater than in a garden-variety, historic test-year rate setting.

IV. COST MODELS

A. Overview of UNE Cost Models

1. Verizon Models

Verizon's TELRIC filing includes models for computing UNE costs for loops, switching elements, and nonrecurring activities. Verizon's LCAM determines the average investment for the representative loop in each distribution area ("DA") (Exh. VZ-36-A; Verizon Brief at 61). Verizon uses the SCIS, a model developed by Telcordia (previously Bellcore), to compute switching costs (Exh.VZ-36, at 131; Exh. VZ-36-B; Exh. VZ-36-C). Verizon uses Excel-based spreadsheets to compute costs in its nonrecurring cost model ("NRCM") (Exh. VZ-37, Part I). We discuss the SCIS in Section VII (Switching) and the NRCM in Section X (Nonrecurring Costs).

The LCAM computes the cost of five types of loops: two-wire analog (basic telephone line); two-wire digital (private line); four-wire analog (Integrated Services Digital Network or "ISDN"); four-wire digital (1.5 megabits per second); and digital data service ("DDS") at the wire center level.[27] The loop model also computes two sets of cost results using different types

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[27] The LCAM operates using Personal Oracle Version 7.34, Microsoft Office 97, and Windows (a version older than Windows 2000) (Exh. VZ-36-A).

of digital loop carrier ("DLC"): one set assumes the use of integrated digital loop carrier ("IDLC") where fiber feeder is deployed, and the other results assume the use of universal digital loop carrier ("UDLC") where fiber feeder is deployed. Verizon then computes its final proposed loop costs separately from the LCAM, using a spreadsheet that: (1) weights the LCAM results based on its proposed proportions of IDLC and UDLC; and (2) adds common overhead and a "gross revenue loader" (Exh. VZ-37, Part B).

The LCAM models a network serving approximately 4.7 million loops in 135 wire centers in Massachusetts (Exh. VZ-36-A; Exh. VZ-37). The loop model is based on an engineering survey[28] that included 135 wire centers and excluded 133 smaller wire centers (Exh. VZ-37, Part B, Section 3; Exh. VZ-36, at 89-90). Verizon provided, in Exh. ATT-VZ 14-32, materials that illustrate the type of information available to its engineers in connection with the survey. These materials included information on 30 feeder routes, 369 DAs, and six rural allocation areas within eight wire centers (Exh. ATT-VZ 14-32-S). Because the survey included all large wire centers (i.e., those with more than 25,000 lines) and also included 73 of 206 small wire centers (those with fewer than 25,000 lines), the survey covers the vast majority of the lines in the state.

The LCAM consists of three modules – Electronics, Plant Characteristics, and Loop Study – and relies on the results of a separate cost model, "VCost." VCost computes the TELRIC annual cost factors, which are applied to the investments that the Loop Module

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[28] Verizon conducted an engineering survey to determine loop plant characteristics, such as length of cable routes and percentages of aerial, underground, and buried cable (Exh. VZ-36-A, at 89; Exh. VZ-38, at 23; Exh. ATT-VZ 14-31; Exh. ATT-VZ 14-33).

develops, based on assumptions about depreciation, cost of capital, taxes, and other factors (Exh. VZ-36-A; Exh. VZ-37, Part B, Section 1).

Verizon developed the LCAM beginning in 1993 to generate "costs for a transitional loop network based on discrete segmentation of the real-world network and overlaying probable future conditions" (Tr. 17, at 3456). The LCAM has been used in the original Bell Atlantic jurisdictions (i.e., New Jersey and states lying to the South) since 1996 for the purpose of computing UNE loop costs (Tr. 17, at 3457-3458). Subsequent to the merger of Bell Atlantic and NYNEX, Massachusetts became the first former NYNEX state in which Verizon submitted the LCAM in a TELRIC proceeding (id. at 3458).

Verizon assumes in its LCAM that, for each DA, the average distribution pair length is half of the longest distribution pair length (the transmission design point) for that DA (Exh. 38, at 35; Tr. 17, at 3464). Verizon indicates that changing that assumption will affect only the length of the distribution cable and nothing else in the study, with the effect being roughly linear; i.e., if the length doubles, the cost of the component will almost double (Tr. 17, at 3465).

The Plant Characteristics Module relies on numerous inputs, such as loop lengths, feeder structure, percent of cable by structure (aerial, buried, or underground) and other network attributes. Verizon derived the Plant Characteristics Module primarily from an engineering survey of Verizon's network completed under the supervision of Verizon's outside plant ("OSP") engineers (Verizon Brief at 61). The engineering survey identifies OSP characteristics, including total loop length (separately for feeder, subfeeder, and distribution) for each distribution area; feeder and distribution structure for each distribution area;

engineering, furnished and installed investments for support structures such as cable; cable size; and total working circuit information (id. at 61-62, citing Exh. VZ-36-A, Section 1.3). Using these input data, the Plant Characteristics Module derives an average feeder and distribution loop length as well as per-pair, per-foot investment for aerial, buried, and underground cable for each wire center (id. at 62). The module uses engineering survey and investment data from the Engineering Cost Record Information System ("ECRIS") to derive cable investment per pair (id., citing Exh. VZ-37, Part B, Section 1.3).

2. AT&T Models

AT&T proposes the Hatfield Model, Release 5.2a-MA, to compute loop, interoffice transport, switching, and interoffice signaling costs. AT&T also proposes an HAI Adjunct Model, which computes costs for network components related to DS1 and xDSL, and a NRC model. AT&T did not seek proprietary treatment for any of its models, but the underlying geocoded customer location information is designated as proprietary by AT&T's vendor, TNS, which licenses use of the data, which come from third parties on condition it not be released. See October 18 Interlocutory Order at 6.

AT&T asserts that the Hatfield Model "provides a realistic, yet forward-looking method for setting UNE rates in Massachusetts" (AT&T Brief at 142). HAI uses "the most efficient network design and available equipment," as well as local terrain characteristics, to determine the quantity of each network component needed to serve the total demand, AT&T states (id. at 148). According to the Hatfield Model's proponents, the model has evolved since AT&T and MCI submitted HAI version 2.2.2 to the Department five years ago, and the current version of the Hatfield Model has addressed the major flaws identified during years of state and federal regulatory proceedings, having benefited from the criticism of regulators and adverse parties (Exh. ATT-25, at 6).

The HAI 5.2a-MA includes 1400 inputs that users can modify (Exh. ATT-25, at 28, exh. RAM-3). The basis of the model is a detailed customer-location database, including demand information for both residences and businesses (AT&T Brief at 147-148). The success rate for geocoding customer locations is 87.5 percent for Massachusetts. For the remaining 12.5 percent of customer locations that could not be identified, the model distributes "surrogate" locations uniformly along roads using information from the Census Bureau's Topologically Integrated Geographic Encoding and Referencing ("TIGER") files (Exh. ATT-25, at 39).

AT&T explains that the Hatfield Model groups customers into clusters, which correspond with Verizon's DAs. The clustering process compiles detailed information about the size, shape, location, number of lines, and existing wire center locations that will serve each cluster (AT&T Brief at 148). In seven steps, the Hatfield Model determines: (1) the amount and location of current demand for local exchange service, network elements, and network interconnection, using geocoded customer location information, where available, and surrogate locations where unavailable; (2) clusters of adjacent customers, which it associates with serving areas that available local exchange technology can efficiently serve (and, in the process, incorporates Verizon-specific data on local terrain and determines characteristics of each cluster); (3) the necessary amounts of various network components to support demand, using numerous optimization routines; (4) the values for user-specified inputs, using public information and expert opinions; (5) the cost of operating and maintaining the network; (6)

per-unit UNE costs which can be displayed by line density range, wire center, zone, census block group, or individual customer location cluster; and (7) outputs and intermediate results in hard-copy and electronic form (Exh. ATT-25, at 25-28).

B. Positions of the Parties

1. Verizon

a. Verizon LCAM

By Verizon's description, its loop cost model uses a "capacity costing" approach, designed "to determine an average, representative cost of providing one loop – i.e., one unit of network capacity" (Verizon Brief at 61). Verizon asserts that the LCAM Plant Characteristics Module uses a forward-looking copper/fiber feeder cable breakpoint ("copper/fiber breakpoint")[29] assumption to determine whether to deploy copper or fiber in the feeder (id. at 62). According to Verizon, its study assumes that 69 percent of the network will be served by fiber, although currently only 19 percent of Verizon's customers are served by fiber (id. at 64, citing Exh. ATT-VZ 4-25). Verizon uses the Electronics Module to determine the weighted average investment for all DLC equipment that the study "deploys," based on inputs such as the unit prices for each DLC configuration, the loops that exceed the copper/fiber breakpoint, and the mix of IDLC and UDLC in the network (id. at 62-63).

According to Verizon, its LCAM study is TELRIC compliant "because it assumes the reconstruction of the network based on a forward-looking engineering design [standard], including reasonable and substantiated assumptions regarding feeder loop length, distribution

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29 Parties also refer to the copper/fiber feeder cable breakpoint as the "feeder breakpoint" or "copper/fiber cross-over point."

loop length, structure mix and design" (Verizon Reply Brief at 122). Verizon refutes AT&T's contention that the LCAM fails to model total demand for an entire element, responding that Verizon's cost experts used a "total element approach, in which the increment [of demand] was the total quantity of the relevant service or element being offered" (id. at 123, citing Exh. VZ-36, at 16). Verizon also rebuts the criticism of AT&T, WorldCom, and the CLEC Coalition regarding certain network sizing assumptions (including the distribution and feeder cable loop lengths and deployment of dedicated remote terminals) (id. at 124-126). Section VI (Outside Plant Inputs) addresses network sizing assumptions.

b. Hatfield Model

Verizon contends that HAI 5.2a-MA is incapable of estimating Verizon's TELRIC costs accurately and urges the Department to reject the model. Verizon asserts that the Hatfield Model is a results-driven costing tool "purposefully designed and manipulated to produce the lowest UNE cost estimates possible" (Verizon Brief at 167-168; Verizon Reply Brief at 163). Verizon criticizes the Hatfield Model as assuming the instantaneous design and construction of an entirely new network that satisfies only existing demand, and claims that its utilization factors are unrealistic and unable to accommodate the growth and churn of a "dynamic, real-world network" (Verizon Brief at 169, 171). Verizon further charges that the model inputs lack adequate support and characterizes the customer location database as a "black box" (id. at 168).

Verizon contends that any abstract modeling tool should have its outputs tested before being used to set rates, and therefore it would be inappropriate to adopt the Hatfield Model because its outputs have not been validated against "real-world results" (id. at 171). To demonstrate that HAI does not portray a realistic network, Verizon highlights discrepancies between the HAI 5.2a-MA cost estimates and CLECs' actual network investment, Verizon's investment in upgrades and expansions over a four-year period, and Verizon's present investment levels (id. at 173-174).

Verizon argues that HAI has a "convoluted and difficult-to-understand" structure and that there is insufficient evidence to demonstrate that the model is functioning reliably (id. at 172). According to Verizon, the Hatfield Model substantially understates the costs of building an actual network, and its inputs result in a network that may not be able to provide all necessary services at requisite service quality levels (id.).

Verizon claims that the Hatfield Model places "houses and businesses where they do not currently exist," and thus it cannot depict accurately "the real-world networks operating in Massachusetts" (Verizon Reply Brief at 168). Verizon further criticizes AT&T for failing to undertake "any independent, Massachusetts-specific, empirical analysis to validate the appropriateness and accuracy of the Hatfield Model's design assumptions, modeling criteria or cost estimates" (id.). One cannot "evaluate or verify meaningfully the reasonableness of the consultants' unsubstantiated opinions," Verizon asserts (id.).

Verizon also faults the HAI because, in Verizon's view: (1) the customer location database is not verifiable due to restraints on the proprietary data and Verizon's witness had inadequate access to the relevant files; (2) the Hatfield Model relies on "dubious 'expert judgment'" of "results-oriented" model developers and inappropriate data sources; (3) the documentation is incomplete, inputs are inadequately supported, and formulas are not clearly explained; and (4) the Hatfield Model fails to adhere to generally accepted engineering guidelines but rather is purely hypothetical (Verizon Brief at 174-201). Verizon disputes AT&T's claim that Verizon's witness Christian Dippon was afforded adequate access to the entire geocoded database and to the clustering algorithm. Instead, Verizon asserts that its witness had access to a "minute, pre-processed portion of the geocoded database" and that the clustering algorithm "was only a software interface," lacking the underlying computer code (Verizon Reply Brief at 169-170). Verizon contends that requesting yet additional time would have been fruitless, because "AT&T and its counsel made it quite clear that Verizon MA would never be afforded the full, unrestricted access it had requested" (id. at 171). Verizon asserts that the C++ code that underlies the clustering algorithm, provided in paper form by AT&T, is incomplete, outdated and irrelevant to this proceeding (id.).

In support of its contention that the Hatfield Model fails to conform to generally accepted engineering guidelines, Verizon asserts that the model fails to satisfy "ultimate demand"; produces far too few distribution areas; inappropriately clusters customers based on an out-of-date customer location database; includes plant mix assumptions that do not correspond with Verizon's specific operating conditions; relies on unrealistic structure costs; and incorporates assumptions regarding structure sharing that are "pure fantasy" (Verizon Brief at 189-201).

Verizon criticizes other features of Hatfield Model, including: assumptions about customer locations; the outdatedness of the Hatfield Model's customer location database; the clustering process, which, according to Verizon, does not necessarily mirror "the practice of real outside plant engineering"; the model's treatment of high-rise buildings; "outside plant facilities that are either too short or too long"; the omission of the Back Bay wire center; and various engineering assumptions (Verizon Reply Brief at 173-187, citing Tr. 16, at 3204). Verizon also criticizes the Hatfield Model's switching module, interoffice module, and treatment of common costs and expense factors (Verizon Brief at 205-207).

In sum, Verizon contends that AT&T is sponsoring a "dead model," rejected by the Department in the Consolidated Arbitrations proceeding, and also by other state commissions and the FCC[30] (id. at 207; Verizon Reply Brief at 163). Verizon identifies ten aspects of the Hatfield Model that, according to Verizon, the FCC rejected in the Platform Order,[31] Inputs Order, and Inputs Further Notice[32] (Verizon Brief at 208-210). Verizon claims that it "is telling" that the FCC's Synthesis Model for universal service costs yields total loop costs for Massachusetts of $17.25, compared to the Hatfield Model's estimate of $7.09 (Verizon Reply Brief at 165). Verizon claims that the regulatory scrutiny to which the HAI Model has been subject is "illusory" and that AT&T has chosen "to correct only those errors with which it agrees" (id. at 164). Furthermore, Verizon asserts that, "given the fundamental defects of the Hatfield Model," it is not surprising that AT&T is now sponsoring a modified version of the

30 Verizon cites to various state orders issued between 1996 and 2000 that did not adopt earlier versions of the Hatfield Model, and to several state orders issued in 2001 and 2002 in which state public utility commissions adopted Verizon's model over the Hatfield Model (Verizon Brief at 210-211, 210 n.229).

31 In the Matter of Federal-State Joint Board on Universal Service, CC Docket No. 96-45, and Forward-Looking Mechanism for High Cost Support for Non-Rural LECs, CC Docket No. 97-160, Fifth Report and Order, FCC 98-279 (rel. October 28, 1998) ("Platform Order").

32 In the Matter of Federal-State Joint Board on Universal Service, CC Docket No. 96-45, and Forward-Looking Mechanism for High Cost Support for Non-Rural LECs, CC Docket No. 97-160, Further Notice of Proposed Rulemaking, FCC 99-120 (rel. May 28, 1999) ("Inputs Further Notice").

FCC's universal service model in three state proceedings and a "reconstituted run" of Verizon's cost models in two other jurisdictions (Verizon Brief at 212).

2. AT&T

a. Verizon LCAM

AT&T asserts that Verizon's LCAM does not apply TELRIC appropriately and relies upon key assumptions that Verizon has neither validated nor proven (AT&T Brief at 142). AT&T observes that, in contrast with the extensive documentation it provided on the Hatfield Model, Verizon has provided minimal documentation of its LCAM (id.).

According to AT&T, the LCAM is not TELRIC-compliant because, among other reasons, Verizon estimates the cost of individual facilities that a CLEC might order, rather than estimating the cost of the total Massachusetts network and then dividing by the entire demand for particular UNEs in order to determine per-unit UNE costs (id. at 143). Furthermore, AT&T faults Verizon's TELRIC studies because they are based on assumptions that are derived largely from Verizon's experience with its embedded network (id.). Furthermore, AT&T considers "arbitrary" Verizon's assumption that, for each distribution area, the average distribution length is one half of the longest existing distribution pair (id. at 145). According to AT&T, Verizon's only justification for this determination is an unsupported assumption that customers are evenly distributed within each distribution area (id.). Also arbitrary, AT&T contends, are Verizon's copper/fiber breakpoints, which, according to AT&T, are not based on an economic analysis of the most efficient design (id. at 145-146).

b. Hatfield Model

AT&T asserts that the Hatfield Model's methodology is "sophisticated and precise" and has been steadily improving since AT&T proposed HAI version 2.2.2 in Massachusetts in 1996 (id. at 148). AT&T contends that subsequent enhancements to the model have addressed all of the criticisms that the Department raised during the Consolidated Arbitrations proceeding (id.).

AT&T cites the following as advantages of the Hatfield Model: (1) it uses the entire quantity of the network element as the increment upon which to base the TELRIC cost study; (2) it analyzes all of the costs of providing a UNE, including plant investment and expenses, and the incremental cost of shared facilities and operations; and (3) it includes forward-looking economic costs and excludes embedded costs associated with a UNE (id. at 147-148). AT&T notes that the FCC's Synthesis Model platform for universal service costs, released in October 1998, adopts the switching, interoffice, and expense version of the HAI 5.0a Model and the TIGER-file road surrogating alternative that the HAI 5.2a-MA Model uses for customer location purposes (id. at 150).

AT&T contends that Verizon's attack of the customer location database "is plainly absurd" because the Hatfield Model "uses the most sophisticated techniques available to accurately determine customer locations" (id. at 150, 152). AT&T observes that the customer databases used by the Hatfield Model are highly reliable because the commercial success of the providers of the information, Metromail, Inc. and Dun & Bradstreet, "depends almost entirely upon the accuracy of the database information they provide" (id. at 151-152).

AT&T states that the customer location data that TNS assembled in its proprietary National Access Line Model ("NALM") uses information sources such as survey information, the Local Exchange Routing Guide, Business Location Research wire center boundaries, Dun and Bradstreet's business database, Metromail's database, Claritas' demographic database, and U.S. Census Bureau estimates (Exh. ATT-25, exh. RAM-2, at 24-34; AT&T Brief at 152). According to AT&T, the FCC has endorsed and adopted this process for estimating the number of customer locations (AT&T Brief at 152, citing Inputs Order at ¶ 51). Furthermore, AT&T asserts, the FCC expressed approval for a geocoded approach to customer location, although it did not adopt a geocoded location database because of concerns about data availability (id.).

Responding to Verizon's assertion that the FCC rejected the use of the customer location database, AT&T states that the surrogate locations that the FCC used were derived from the same customer location database that Verizon claims the FCC rejected (id. at 157, citing Inputs Order at ¶¶ 51-60). AT&T further observes that the Hatfield Model can run the 100 percent road surrogate database that the FCC used, although that would entail losing some of the more precise customer location information in the TNS database (id. at 158).

AT&T refutes Verizon witness Dippon's assertion that he was able to access and review only a small portion of the geocoded database, countering that the witness was provided with access to complete information for the approximately three million separate residential and business customer locations in Massachusetts (id. at 156). AT&T states that it provided Verizon access to the entire geocoded database as well as the entire 4,166-cluster database (id.). AT&T indicates that an additional five days of access were granted to Verizon's witness, and that Verizon never reported to either AT&T or to the Department that it required additional access (id. at 156-157).

AT&T states that the analysis of Verizon's witness apparently was limited not because of his claimed inability to access information, but because, according to his own testimony, the scope of his "assignment" was limited (id. at 159-160). AT&T contends that, because Verizon's consultant "made no attempt to undertake the kind of validation" he could have undertaken, the Department should not afford any weight to Verizon's assertion that the geocoded data was unverifiable (id. at 160). AT&T also notes that, despite Verizon's claim to the contrary, AT&T did provide an electronic copy of the clustering algorithm C++ code to Verizon in September 2001 (id. at 158, citing Exh. VZ-ATT 1-26-S).

The HAI Model "uses a strand normalization mechanism which fully captures the effect of customers being concentrated in portions of certain clusters" (AT&T Reply Brief at 99). Responding to Verizon's criticism of the Hatfield Model's distribution of customers, AT&T counters that the LCAM assumes that customer locations are evenly dispersed and thus, even if the HAI model did the same (which it does not), Verizon cannot credibly criticize this aspect of the HAI model (id.). AT&T argues that Verizon's inability to identify differences between the HAI customer location data and its own customer information "warrants the inference that no such contrary evidence exists" (id. at 98). In defense of its use of 1997 data, trued up using a normalization process based on current Automated Record Management Information System ("ARMIS") line count data, AT&T indicates that the FCC adopted a similar approach in its Synthesis Model (id. at 98-99).

Characterizing Verizon's criticisms of "three fundamental problems" with HAI's customer location process as "red-herrings," AT&T responds to the first criticism that the result of HAI's using different databases for geocoding actual customer locations and road surrogate locations slightly increases customer dispersion, thus increasing outside plant and costs, but only "very slightly" (id. at 100). Second, AT&T asserts that criticism regarding customer locations not being set back 50 feet from the road is a restatement of the first concern (id.).

Further, though Verizon points to alleged "anomalies" in HAI's clustering, AT&T counters that Verizon's witness found only four cluster anomalies among 4,166 customer clusters in Massachusetts (id. at 101). Furthermore, according to AT&T, those anomalies occurred because of the model's 1,800-line limit upon cluster size – an aspect of the model that AT&T asserts Verizon's witness failed to analyze correctly (id.). AT&T also explains that any overlapping high-rise clusters that may occur due to the lack of a "footprint" database "has no impact on the accuracy of the model's plant calculations" (id. at 102). Regarding Verizon's concern that the HAI model omitted a wire center, AT&T describes the minimal impact of re-running the model with that wire center, and counters that Verizon "has filed repeated revisions and corrections to its switch cost model, outside plant cost model, and nonrecurring charge model throughout this proceeding" (id. at 102-103).

AT&T contends that HAI's customer clustering method facilitates efficient engineering; its use of larger distribution areas and serving area interfaces ("SAIs") allow the Hatfield Model to enjoy economies of scale that Verizon's model does not; and its use of rectilinear or right angle distance calculations results in more accurate measurement of distribution loop length than does Verizon's straight-line distance measurement (AT&T Brief at 153-155). In the Hatfield Model, feeder routes over 9,000 feet are fiber because, according to AT&T, for these distances use of fiber is the most economic choice and comports with generally accepted industry standards (id. at 155). For distances below 9,000 feet, HAI determines the economically efficient technology on a cluster-by-cluster basis, yielding a mix of 49.2 percent fiber feeder and 50.8 percent copper feeder (id.). AT&T contends that Verizon is now attempting to analyze the copper/fiber breakpoint in a similar manner in other states (id.).

AT&T rebuts several of Verizon's criticisms of the Hatfield Model's engineering assumptions, arguing that: (1) the FCC has found that the use of a clustering algorithm is appropriate; (2) reducing backbone cable investment to account for tapering is not only reasonable, but Verizon itself takes tapering into account when designing outside plant; (3) contrary to Verizon's claim, the cluster sizes in the Hatfield Model are not too large, and, furthermore, both the FCC's findings and Verizon's own operations documents support the consolidation of smaller serving areas; (4) the Hatfield Model's SAI sizing algorithm is reasonable; (5) in its determination of the quantity of buried plant, the Hatfield Model considers the lifetime costs and the costly maintenance of aerial plant; (6) the Hatfield Model appropriately takes into account terrain; (7) AT&T's assumption of $3,000 for remote terminal ("RT") sites is reasonable as is its assumption of all above-ground RTs; (8) Verizon fails to demonstrate why its pole spacing assumption is more reasonable than the HAI's assumptions; and (9) the increasing influx of cable television facilities means that AT&T's assumptions about structure sharing are reasonable (AT&T Reply Brief at 105-110). AT&T contends that

Verizon, by claiming that the Hatfield Model fails to provide for spare capacity and is thus static, deliberately misrepresents the model, which results in an effective distribution fill of 48.4 percent (id. at 94-95).

In response to some of Verizon's specific concerns about validation of the HAI's results, AT&T counters that: (1) it attempted to validate the HAI route distances with Verizon's own data, but Verizon could not produce the relevant data; (2) the HAI model computes statewide average loop length approximately ten percent higher than the Verizon average; (3) Verizon's comparison of costs of its embedded network with HAI outputs is irrelevant; and (4) when the LCAM is re-run with the values AT&T considers appropriate, the difference between the HAI Model and the LCAM statewide average loop rates is only $0.18 (id. at 96-97).

Regarding Verizon's assertion that the total investment levels HAI produces are substantially less than Verizon's historic investment levels, AT&T notes that, according to the FCC, the forward-looking costs of plant construction are costs that an efficient carrier would incur, rather than the costs of embedded plant (AT&T Brief at 161-162). AT&T further observes that Verizon's own model yields plant investment below booked values (id. at 162). As an example, AT&T observes that Verizon's LCAM calculates $9.1 million in investment in poles, far less than the $87.2 million investment the Hatfield Model computes (id. at 161-162).

AT&T states that it has thoroughly supported the Hatfield Model with extensive documentation and submission of electronic components (AT&T Reply Brief at 104). AT&T meanwhile observes an inherent contradiction in Verizon's views, because Verizon faults the HAI Model for relying on "expert" judgment, but Verizon similarly relies on "expert" judgment in support of its own inputs (id.). Furthermore, AT&T argues that "Verizon's failure to produce any concrete evidence to disprove any of the input data used in the HAI 5.2a-MA model indicates that no such contrary evidence exists" (id. at 105).

AT&T argues that its use of national expense ratios approved by the FCC "prevents Verizon from recovering costs caused by its own inefficient operations" (id. at 110). AT&T argues that the HAI inputs are fully supported (id.). AT&T characterizes Verizon's observation that in other jurisdictions AT&T has sponsored either a version of the FCC's Synthesis Model or has not sponsored a model as "a silly point" (id.). AT&T observes that the Synthesis Model is "a close cousin that adopts the key aspects of HAI's customer location and clustering approach" and also that Verizon sponsors different models in the former GTE territory than what it sponsors here (id.). AT&T states that the FCC, "after detailed testing and analysis of several proposed cost models, adopted significant aspects of HAI in its Synthesis Model, including HAI use of geocoded data to determine customer locations, use of a clustering algorithm to group those customer locations into serving or distribution areas, the association of those clusters with telephone company serving areas, and the estimation of the quantity and cost of outside plant needed to serve the customer locations within each cluster" (id. at 111). Countering Verizon's reference to state commissions' rejection of the Hatfield Model, AT&T indicates that regulatory commissions in Kentucky, Louisiana, Hawaii, Nevada, Minnesota, and Texas adopted the recent Hatfield Model and the Arizona Corporation Commission administrative law judge ("ALJ") recommended adoption of the 5.2a-MA model to set UNE rates (id. at 112-113).

Finally, while it rigorously promotes the Hatfield Model, AT&T concedes that the establishment of pro-competitive TELRIC-compliant rates depends less upon the selection of one model over another and more upon the selection of "appropriate inputs" (id. at 93).

3. WorldCom

WorldCom asserts that Verizon's model fails to account properly for growth (WorldCom Brief at 41, 58). WorldCom's criticisms of Verizon's model go to the issues of inputs and the engineering survey used to determine the feeder and outside plant modeled by Verizon, described in Section VI (Outside Plant Inputs).

4. CLEC Coalition

The CLEC Coalition faults numerous specific assumptions and inputs in Verizon's loop cost model, but does not address the model, per se (CLEC Coalition Brief at 37-73). Section VI.B (Inputs for Basic Loops) addresses these concerns.

C. Analysis and Findings

1. Overview

In this proceeding, as the Department conducts its second review of cost models proposed for computing UNE loop costs in Massachusetts, we rely not only on our own precedent, but also on the FCC's guidance in various proceedings to assess the TELRIC models that parties have submitted. The FCC has stated that, to be TELRIC-compliant, "prices that potential entrants pay for these [network] elements should reflect forward-looking economic costs in order to encourage efficient levels of investment and entry." Local Competition Order at ¶ 672. A UNE cost model therefore must be designed to compute forward-looking economic costs. In its evaluation of models to be used to compute universal service support, the FCC recognized that:

> [T]he task of establishing a model to estimate forward-looking costs is a dynamic process that will need to be reviewed and adjusted periodically. We must balance the needs to provide predictability and certainty with the need to account for changes that inevitably will occur over time, such as technological advances.

Platform Order at ¶ 13.

The FCC further stated that:

> The cost study or model must include the capability to examine and modify the critical assumptions and engineering principles. These assumptions and principles include, but are not limited to, the cost of capital, depreciation rates, fill factors, input costs, overhead adjustments, retail costs, structure sharing percentages, fiber-copper cross-over points, and terrain factors.

Universal Service Order[33] at ¶ 250.

Among the criteria that the FCC set forth for determining forward-looking economic costs in its universal service proceeding is the requirement that "the cost study or model and all underlying data, formulae, computations, and software associated with the model must be available to all interested parties for review and comment." Inputs Order at ¶ 38. Also, "[a]ll underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible." Universal Service Order at ¶ 250(8).

Based on this FCC guidance on cost model principles, in determining which, if either, of the proposed models are suitable for computing TELRIC costs for UNEs, we must examine each model to determine: (1) whether it is reviewable (i.e., whether it is possible to find and

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33 In the Matter of Federal-State Joint Board on Universal Service, CC Docket No. 96-45, Report and Order, FCC 97-157 (rel. May 8, 1997) ("Universal Service Order").

understand the financial and numerical relationships inherent in the model); and (2) whether the structure itself provides a good representation of a reconstructed local network that will employ the most efficient technology for reasonably foreseeable capacity requirements. Phase 4 Order at 8.

This assessment of the models is distinct from our analysis of particular "inputs" to the models. Indeed, in this proceeding, the selection of the inputs will affect the cost results significantly more than the selection of the model (see Tr. 15, at 3011; Tr. 16, at 3134). Also, decisions as to the appropriate assignment of certain categories of costs (e.g., decisions regarding the proper allocation of costs between usage-sensitive and non-usage-sensitive UNEs, and between recurring and nonrecurring costs) will bear directly on UNE cost results, regardless of the model adopted. We discuss the particular inputs and assumptions in other sections of this Order, and, in the compliance phase of this proceeding, we expect Verizon to re-run the model with the inputs we determine to be necessary for forward-looking cost studies. In the following sections, we analyze the strengths and weaknesses of both models. For the reasons discussed below, we find that Verizon has sustained its burden of proving the reasonableness of using LCAM as a tool to model TELRIC for loop UNEs.

2. Hatfield Model

In the Phase 4 Order, the Department rejected an earlier version of the HAI Model, version 2.2.2. The Department concluded that the HAI's creation of outside plant based on census block group data was unrealistic, because the model placed customers where they did not currently exist. The Department found that the Verizon model, based on a random sample of actual loop plants from existing wire centers, better represented the actual layout of wires and customers in the state. In rejecting the HAI Model, the Department stated that AT&T had not presented data or results to demonstrate that HAI accurately portrays the configuration of outside plant in Massachusetts. Phase 4 Order at 21.

The Hatfield Model has evolved considerably since version 2.2.2 was submitted in the 1996 Consolidated Arbitrations proceeding. The record demonstrates that the model has improved – and, indeed, the FCC adopted some of its attributes in its Synthesis Model. We note that the Hatfield Model is easy to use and well-documented. Issues such as whether the Hatfield Model utilization factors adequately account for growth and churn during the planning horizon are distinct from whether the model itself is capable of portraying a forward-looking, TELRIC-compliant network.

Verizon expresses the concern that the Hatfield Model results have not been "validated" against "real-world" results. Validation is not such a straightforward exercise, however. Verizon uses its existing network as its starting point, and then, in its model, through its selection of technology, inputs, and algorithms, seeks to transform today's network into an appropriately forward-looking network. By contrast, AT&T begins with the existing wire centers and uses its best estimate of customer locations in Massachusetts to model a hypothetical network to serve those customers as well as future customers.

TELRIC studies are not intended to represent blueprints for outside plant engineers, nor are the TELRIC costs intended to correspond with embedded investment. On the other hand, models should correspond with the deployment of feasible least-cost technology and practices that are achievable by the ILEC. One way to partially corroborate the model results is to assess whether, if run with similar inputs, the LCAM and the Hatfield Model yield comparable results. AT&T's witness Michael Baranowski makes a series of twelve well-documented modifications to Verizon's LCAM, using inputs that more closely resemble the default values in the Hatfield Model. The use of these revised inputs substantially narrows the gap between the UNE loop cost results of the two models. The changes include such assumptions and modifications as: 100 percent IDLC, distribution fill at 64 percent, fiber feeder fill at 100 percent and copper feeder fill at 80 percent; reduction of maintenance expenses; revised depreciation and cost of capital; and elimination of advertising expenses (see generally, Exh. ATT-23-P). With these and other modifications proposed by AT&T, the LCAM yields a statewide average monthly loop cost of $7.76, similar to the Hatfield Model result of $7.09, and quite different from Verizon's default (i.e., proposed) loop cost of $18.75, providing compelling evidence of the relative importance of the inputs compared to the choice between the two models (see Exh. ATT-23-P at 45).

Verizon did not make a corresponding effort to run the Hatfield Model with changes to the inputs that it considered appropriate. AT&T's response to a Department record request shows that the result of making only a few changes to the Hatfield Model (modified capital structure and cost of equity, fill factors, and use of UDLC) is to raise the loop cost to $12.72 (RR-DTE-59). Although the response to RR-DTE-59 does not capture in the Hatfield Model all of the inputs that Verizon proposes, the analysis demonstrates the sensitivity of the model to the assumptions.

These comparative statistics suggest that many of Verizon's criticisms go more to inputs than to model design. Models' results are sensitive to the inputs that users specify; one simply cannot compare the results of the models in order to determine whether they are valid.

For example, Verizon's claim that the Synthesis Model's result of $17.25 for Massachusetts somehow invalidates the Hatfield Model because the latter model yields only $7.09 is simplistic and illogical. Furthermore, although Verizon contends that the Hatfield Model fails to account for future customer demand, the effective fill factor in the Hatfield Model is 48.4 percent, which provides a level of spare capacity similar to the effective fill of 40 percent that Verizon proposes[34] (Exh. ATT-26, at 10; Exh. VZ-37, Part B, Subsection 5.10). Thus, contrary to Verizon's assertion, the question is not whether the Hatfield Model fails entirely to build in extra capacity for growth (the evidence clearly indicates that it does), but to what degree does it make sufficient allowance for growth. From a modeling perspective, because the user can modify this input to the Hatfield Model, Verizon's criticism is not relevant to the selection of a model.

Likewise, though Verizon identifies specific features of the Hatfield Model that the FCC rejected, many of these are user-set inputs (Verizon Brief at 208-210). The FCC concluded that "a model is most likely to select the least-cost, most-efficient outside plant design if it uses the most accurate data for locating customers within wire centers, and that the most accurate

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[34] The models both make allowances for spare capacity, assuming that the hypothetical network should provide adequate capacity for administrative purposes and growth. The LCAM model includes an effective fill of 40.0 percent for distribution (Exh. VZ-37, Part B, Subsection 5.10, "UTIL_MD"). By contrast, the Hatfield Model allows the user to set a target utilization factor. The Hatfield Model's default target fill factor for distribution is 75 percent, yielding an effective fill factor of 48.4 percent (Exh. ATT-26, at 9-10). This difference between the target and effective fill factors exists because of "breakage" (that is, availability of different cable sizes): for example, although demand (accounting for existing customers, spare and growth) might be 75 loops, a model would need to deploy a 100-loop cable size to account for breakage. See Exh. ATT-26, at 10).

data for locating customers within wire centers are precise latitude and longitude coordinates for those customers' locations." Platform Order at ¶ 33. The FCC stated that its model platform combined "the best elements from each of the three models currently in the record." Id. at ¶ 4. While it may not have adopted every attribute of the Hatfield Model, the FCC did find some features of it to be useful and reasonable. However, the FCC did not adopt major critical attributes that affect loop costs, such as the clustering algorithm and outside plant design algorithm. The FCC chose algorithms of another model (the Hybrid Cost Proxy Model) over HAI's. See id. at ¶¶ 27, 48-49, 53, 57, 59, 60.

AT&T attempted to validate the HAI route distances with Verizon's own data, but was unable to obtain the necessary information from Verizon (Exh. ATT-26, at 66). Verizon faults AT&T's inputs because they rely on "consultants' unsubstantiated opinions" (AT&T Reply Brief at 168). Yet in many instances Verizon requests that the Department rely on opinions of its engineers and product managers regarding, for example, the proposed copper/fiber breakpoint thresholds and feature port additives. The Department is thus confronted with the question of whether to afford more weight to Verizon employees' opinions and judgment than to those of other parties. In considering the complexity of the record, we find that there is not one general answer to this question, but rather, depending on the specifics of the information, the context of the judgment, and the particular analysis being undertaken, we need to determine which information propounded by the parties, if any, is more plausible. Just as we cannot entirely dismiss the "judgment" of Verizon's employees, nor can we entirely fault AT&T for its reliance on consultants' opinions.

Although the Hatfield Model has improved since 1996, two fundamental drawbacks render it less desirable for this proceeding than Verizon's LCAM. First, the Hatfield Model relies on a proprietary third-party database, which necessarily limits parties' and the Department's access to critical underlying information. We recognize that AT&T provided a data set that included the latitude and longitude for each of three million customer locations, and, indeed, Verizon's witness Mr. Dippon believes that he had more time in this proceeding to examine the data than he was allowed in other jurisdictions (Tr. 16, at 3190, 3223-3225). The Department also granted Verizon's request for additional time to explore the data (id. at 3234-3235). Although Verizon's witness recalls expressing a concern to Verizon that the process would not "enable [him] to validate the database," Verizon did not ask the Department for assistance in designing a process that would have enabled Mr. Dippon to conduct such an analysis (id. at 3235-3236).

The cumbersome nature of the remote access to the database, and most importantly the fact that an essential underlying database is controlled and operated by a third party detracts from the Hatfield Model. A model that relies on a third party proprietary database necessitates unwieldy approaches for obtaining access by interested parties.[35] Furthermore, although from

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35 See, generally, August 31 Interlocutory Order and October 18 Interlocutory Order (addressing discovery disputes between AT&T and Verizon over access to the TNS geocoded database). The FCC was also reluctant to rely on proprietary data. In the Inputs Order, the FCC affirmed its "conclusion in the Platform Order that geocode data should be used to locate customers in the federal mechanism," but it also concluded "that no source of actual geocode data has yet been made adequately accessible for public review." Inputs Order at ¶ 36. Until such time as it could locate a better source, the FCC decided to use an algorithm based on the location of roads to create surrogate geocode data for customer locations. Id. at ¶¶ 36, 47. The FCC ultimately expended substantial effort to develop the Synthesis Model, based on the best elements of the various proposals.

a modeling perspective, the existence of 1400 user-specified inputs provides significant flexibility, the fact that these inputs are, in many instances, based on national data, which do not necessarily correspond to the least-cost technology and operations for Verizon in Massachusetts, renders the Hatfield Model ultimately inappropriate for this proceeding.

Finally, as discussed above, the model inputs are far more significant to the accurate calculation of least-cost, forward-looking TELRIC than the selection of the models. Because the Hatfield Model relies on a proprietary third-party database, and because the 1400 user-specified inputs to HAI do not necessarily correspond with the least-cost forward-looking technology and practices appropriate for Massachusetts, we do not adopt the Hatfield Model for the purposes of computing loop costs.

3. Verizon LCAM

The Department concluded in 1996 that the Verizon loop cost model provided "a good representation of a reconstructed local network that will employ the most efficient technology for reasonably foreseeable capacity requirements." Phase 4 Order at 16-17. Verizon's proposal in this proceeding to use LCAM to compute UNE loop costs again raises the question of whether a capacity-oriented approach to costing, based on an engineering survey of existing loop plant, represents a reasonable methodology for modeling forward-looking, efficiently provided UNE loops. As a separate issue, if the Department approves LCAM as a modeling tool for computing UNE costs in Massachusetts, the Department must determine whether Verizon has adequately demonstrated the accuracy of the underlying data.

Regarding the adoption of LCAM, we note that Verizon's use of its embedded network architecture as the basis of its study can lead to reasonable results, provided that proper adjustments are made to the technology assumptions and the input values selected. By contrast, the theoretical deployment of an entirely new distribution and feeder architecture would add complexities, such as obtaining rights of way, that could give rise to additional costs. Therefore, because Verizon's reliance on existing network architecture as the starting point can lead to reasonable cost results provided that appropriate modifications are made to render the network "more forward-looking," we find that the LCAM is a reasonable tool for modeling UNE loop costs. Loop costs are further addressed in Section VI (Outside Plant Inputs).

We now turn to the issue of the validity of the source for the loop data upon which the LCAM relies. In the Consolidated Arbitrations proceeding, the Department determined that Verizon's use of a random sample of ten percent of the wire centers for each density zone to model loop plant was reasonable. Phase 4 Order at 13. In its current filing, Verizon submitted data gathered from a much larger sample of wire centers, thus increasing the potential accuracy of Verizon's loop cost study. The Department previously stated that an assessment of whether efficiency gains could be achieved by a physical reconfiguration of forward-looking technologies was "simply not practical without a circuit by circuit topographical study." Id. at 14. Such a study remains impractical, as it would not be feasible for Verizon to examine each and every circuit within Massachusetts to assess whether a physical reconfiguration of feeder and distribution routes would yield efficiency gains.

The engineering survey upon which Verizon relies for its loop characteristics is a critical input to Verizon's loop cost model. In conducting its survey of 135 wire centers, Verizon reviewed 30 feeder routes, 369 distribution areas, and six rural allocation areas within eight wire centers (Exh. ATT-VZ 14-31-P; Exh. ATT-VZ 14-32-S-P; Exh. ATT-VZ-33-P). Verizon obtained the review data from the Feeder Administration Record for each wire center, which includes a feeder section schematic (where available), and distribution area documentation records (Exh. ATT-VZ 14-32-S-P). We find that Verizon has provided sufficient validation of the data it uses to construct its LCAM model and that, with the appropriate modifications to the assumptions about inputs, the existing network configuration can be used to compute reasonable estimates of forward-looking costs.

Further, in order to determine that the LCAM will yield accurate economic signals[36] to UNE loop consumers (and to potential UNE loop suppliers), the Department must assess whether the model makes economically efficient choices in "deployment" of network facilities. Section VI analyzes many of these choices in the context of outside plant inputs, but we address one modeling assumption here: the copper/fiber matrix. In 1996, the Department approved Verizon's proposed assumption of 100 percent fiber feeder. In this proceeding, Verizon proposes instead to assume a mixture of copper and fiber feeder in its loop cost study. We address two issues: (1) the reasonableness of using a matrix for this model attribute; and (2) the reasonableness of Verizon's proposed values for its matrix.

Regarding the first point, Verizon could improve its algorithm so that the LCAM determines whether to deploy copper or fiber for particular feeder routes within the modeled network based on the economics of the specific situation rather than using pre-specified

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36 The price should indicate accurate costs so that societal resources are expended in an economically efficient manner. Cost-based price signals enable competitors to make informed decisions as to when it is more efficient to build new facilities and when it is more efficient to lease Verizon's facilities.

crossover points. Mitigating this concern, however, is the fact that Verizon designed LCAM so that users can change the values in its matrix, and thus users can run LCAM with different, potentially more economically efficient, copper/fiber assumptions.

Secondly, sensitivity analyses Verizon conducted with the LCAM validate the economic efficiency of Verizon's decision to depart from its earlier assumption of 100 percent fiber (RR-DTE-89). While it is appropriate that Verizon revise its TELRIC studies to incorporate the most recently available information that affects the choice of economically efficient technology, the record indicates that the algorithm that Verizon uses to determine the relative proportions of fiber and copper feeder requires fine-tuning. Although users can modify the breakpoints, these breakpoints are inputs to the model, rather than determinations made by the model, and thus efficient results can be determined only through trial and error, rather than dynamically by the model itself. Furthermore, Verizon did not conduct any sensitivity analysis of this attribute before submitting its proposed LCAM (Tr. 17, at 3402). By contrast, the Hatfield Model determines within the model where it is economically efficient to deploy copper or fiber in the feeder through a life-cycle costing analysis.

The evidence also indicates that Verizon's LCAM does not model the most economically efficient copper/fiber cable breakpoint for the feeder component of the loop. Specifically, modifying Verizon's default "matrix" for the copper/fiber breakpoints lowers UNE loop costs (see RR-DTE-89). For example, changing the urban and suburban copper/fiber breakpoints in the LCAM from 4000 and 5000 feet, respectively, to 9000 feet, decreases the monthly UNE loop costs (unloaded) for the urban and suburban zones by $3.10 and $1.72, respectively (where UDLC is assumed) (id.). Where IDLC is assumed, the corresponding decreases for urban and suburban loops are $0.96 and $0.42, respectively (id.). The cost results for approximately 1.9 million urban loops and 2.3 million suburban loops (i.e., for approximately 88 percent of the loops) are affected by this decision (id.).

From a modeling perspective, whereas the LCAM "hardwires" this attribute rather than determining the efficient mixture within the model, the Hatfield Model determines the least-cost option for a given cluster based on which will be the lower cost alternative. Verizon indicates that changing its copper/fiber thresholds "could affect the percentage of lines served by integrated and universal DLC" and that changing these percentages "would affect the switching and nonrecurring studies in addition to the loop study" (RR-DTE-90) (emphasis added). Verizon indicates than an estimate of the cost impact "would require a time consuming analysis" (id.).

Nevertheless, with modifications to the matrix inputs, which we discuss in Section VI.B.3, we find that Verizon's four-tier copper/fiber matrix can model sufficiently efficient deployment decisions. The record shows that modifying the values in the copper/fiber matrix leads to significant cost differences; however, the actual magnitude of the cost difference depends on many assumptions, such as global cost inputs, the respective percentages of IDLC and UDLC, and fill factors, and thus will depend on the effect of other directives set forth in this proceeding. According to Verizon, changing the values in the matrix possibly results in an unquantified impact for other cost studies. Section VI.B addresses the determination of the appropriate values for the copper/fiber matrix. In its compliance filing, Verizon must demonstrate any changes to its TELRIC studies for other UNEs caused by changing the values in the copper/fiber matrix.

We determined above that, with the appropriate modifications to the user-specified inputs, LCAM can be used to compute UNE costs. The record demonstrates that users can change the default values in the LCAM for network characteristics such as the target utilization factors, network component costs, and global cost factors (see Exh. VZ-23, at exh. MRB-1; Exh. VZ-23-P, electronic workpapers). Consistent with our standard in the Consolidated Arbitrations, we find that the LCAM is reviewable and that "its structure provides a good representation of a reconstructed local network that will employ the most efficient technology for reasonably foreseeable capacity requirements." Phase 4 Order at 8. Therefore, for all of the reasons described above, we adopt Verizon's LCAM, with the modifications to input values directed in this Order, to compute UNE loop costs.

We note that running LCAM requires the use of a version of Personal Oracle that is no longer available, and whether Verizon modifies its LCAM so that it becomes compatible with presently available software depends on whether the LCAM continues to be Verizon's "model of choice" (Tr. 17, at 3463). Inevitably, cost models evolve to incorporate the impact of technological changes in the telecommunications network and software changes. When Verizon designs the loop cost model that it intends to submit with its next TELRIC filing in five years (see Section XII, below), it should incorporate the following changes: the model should run with software that is commercially available and supported by software vendors at the time of the filing of the cost studies, and that promises to be so available and supported for a reasonable period after the filing; where feasible, decisions that reflect economic choices should be modeled to do that dynamically (e.g., copper/fiber breakpoints should not be entered as inputs to the model, but rather should be determined dynamically by the model); and (3) the model should include recent and comprehensive supporting documentation for its design, operation, and inputs.

4. Summary of Findings on Suitability of Models

Neither cost model filed in this proceeding is ideal. The Department finds that Verizon's LCAM, with the various modifications directed herein, is the more reliable tool for computing UNE costs. The LCAM does not require Verizon to compute costs based on a model that in turn relies on a third-party database; other parties have been able to re-run the LCAM with their proposed modifications; and the network that the model "deploys" is clearly achievable by Verizon. Finally, in its compliance filing, Verizon must identify clearly how it incorporates our directives in its LCAM.

V. GENERAL INPUTS

A. Cost of Capital

1. Introduction

The cost of capital measures the return investors can expect on investments of comparable risk and is the weighted average of: (1) the cost of debt (market interest rate a firm would have to pay on newly-issued debt obligations); and (2) the cost of equity (return investors expect to receive on alternative equity investments of comparable risk). Verizon translates its estimated investment costs for UNEs into recurring (monthly) costs based, in part, on its cost of capital. Verizon also uses its cost of capital to discount future values to today's values. Therefore, the Department must establish a cost of capital in this proceeding that is appropriate for use in Verizon's TELRIC studies.

Verizon proposes a 12.95 percent cost of capital, but for the purpose of the cost study in this proceeding, it adopted a cost of capital of 12.6 percent. The estimate is based on a cost of equity of 14.75 percent, a cost of debt of 7.55 percent, and a capital structure of 25 percent of debt and 75 percent of equity using the Standard & Poor's ("S&P") Industrials as a comparison group.

AT&T, on the other hand, proposes a cost of capital of 9.54 percent, which is based on a cost of equity of 10.42 percent, a cost of debt of 7.86 percent, and a capital structure of 34.5 percent of debt and 65.5 percent of equity based on the average market structure and book value capital structures of a group of Telephone Holding Companies ("THCs"). WorldCom and the CLEC Coalition support the cost of capital advocated by AT&T.

2. Positions of the Parties

a. Verizon

Verizon claims that the appropriateness of its cost of capital is affirmed by the Department's adoption of a 12.16 percent cost of capital in the Phase 4 Order and by AT&T's own internal cost of capital for the local exchange market (Verizon Brief at 36). Verizon states that its cost of capital under the TELRIC regulatory construct, including the assumption of a fully competitive market, would be significantly higher than what Verizon proposes because it did not reflect the risks that the network would be repeatedly and completely revalued based on the assumptions embodied in AT&T's HAI model (id.).

Verizon states that AT&T and WorldCom's cost of capital significantly understates forward-looking TELRIC costs and violates the FCC's requirement of a fully competitive market in estimating cost of capital, a requirement Verizon contends the Department recognized in the Phase 4 Order (id. at 37). In fact, Verizon argues, AT&T and WorldCom's historical cost of capital approach is inconsistent even with the competitive risks present in today's market, because Verizon faces existing and increasing competition from facilities-based providers of local service and, as the Department has acknowledged, from bypass technology (id. at 40). Verizon also argues that as competitors gain a stronger foothold in the market, the availability and prevalence of wholesale competition is likely only to increase (id. at 41).

Verizon further states that AT&T and WorldCom also ignore the regulatory risks faced by Verizon as a wholesale provider of TELRIC-based UNEs (id.). Verizon contends that it is required to make significant sunk investments to facilitate the movement of business off its network, but that carriers are not even obligated to take service (id.). Additionally, Verizon argues that the risk of changes in demand and technology that telecommunications firms generally must bear is significantly exacerbated by TELRIC requirements that prices be set on the assumption of a significantly more competitive environment than the one that exists today (id.).

Verizon also argues that AT&T and WorldCom's use of a book value capital structure to estimate the cost of capital contradicts the Department's findings in the Phase 4 Order as well as the FCC's statements regarding the theoretical framework of TELRIC (Verizon Reply Brief at 23-24). Verizon claims that in a competitive market investors and analysts rely on market value capital structures, not book value capital structures, to estimate the cost of capital (Verizon Brief at 43).

Similarly, Verizon states that AT&T and WorldCom's proxy group is too small to calculate an accurate estimate of the cost of capital for use in UNE studies because this group consists solely of THCs, which are less risky than an operating company engaged solely in providing TELRIC-based UNEs (id. at 45). According to Verizon, the proxy group of THCs can diversify away many of the technology risks Verizon faces in a competitive UNE market (id.). Verizon contends that, in the absence of a large sample of public companies whose sole business is the provision of UNEs to competitors, Verizon determined that the use of S&P Industrials is a reasonable and appropriate proxy group (id. at 44).

In addition, Verizon claims that AT&T and WorldCom's three-stage discounted cash flow ("DCF") Model produces irrational results (id. at 45). Verizon argues that AT&T and WorldCom's assumptions of earnings and dividends for their proxy groups are arbitrary and ignore the fact that it is common for companies to grow at rates much greater than the growth assumed by AT&T and WorldCom, especially in a rapidly growing industry such as telecommunications (id. at 46). Verizon states that AT&T and WorldCom's arbitrary and unsupported growth assumptions produce DCF results that significantly understate Verizon's cost of equity (id.). Verizon argues that the three-stage DCF model produces illogical results that higher risk companies have a lower cost of equity than lower risk companies, and, therefore, the three-stage DCF model fails the basic test of reasonableness (id.).

Finally, regarding the FCC's concern in Application of Verizon New England, Inc. for Authorization to Provide In-Region, InterLATA Services in Massachusetts, CC Docket No. 01-9, Memorandum Opinion and Order, FCC 01-130 (rel. April 16, 2001) ("Massachusetts 271 Order") with the cost of capital adopted by the Department in the Phase 4 Order, Verizon argues that the FCC did not conduct a full UNE pricing proceeding in the Verizon Massachusetts 271 case, and did not engage in an in-depth analysis of the rationale for all the cost assumptions underlying each input (Verizon Reply Brief at 25). Verizon contends that the FCC did not question the principles underlying the Department's evaluation of Verizon's Section 271 compliance, including the Department's finding that a competitive market should be consistently assumed throughout a TELRIC cost study (id.). Verizon claims that the FCC's own analysis of the appropriate assumptions for a TELRIC-compliant cost of capital specifically requires that the relevant competitive and regulatory risks be assumed (id. at 25-26).

b. AT&T

AT&T recommends that the Department adopt a weighted cost of capital of 9.54 percent, which it claims is consistent with the decisions of other state commissions in the Verizon-East region that have adopted rates between 8.42 percent and 10.5 percent (with only West Virginia being at 11.25 percent) (AT&T Brief at 11, 13). According to AT&T, although the majority of the decisions were from 1997, it is notable that more recent decisions have demonstrated a trend towards even lower weighted costs of capital (id. at 15).

As further support for its proposed 9.54 percent weighted cost of capital, AT&T notes that Verizon, in its application to the FCC for Section 271 authority in Rhode Island, admitted that Rhode Island's weighted cost of capital of 9.5 percent complied with TELRIC principles and was reasonable (id. at 13). Similarly, AT&T contends that Verizon, in its very recent application to the FCC for Section 271 authority in New Jersey, admitted that the 8.8 percent cost of capital adopted by the New Jersey BPU is appropriate and TELRIC-compliant (AT&T Reply Brief at 30). In fact, AT&T argues, these recent state decisions suggest that the

Department should use AT&T's proposed cost of capital as an upper, not a lower, bound (id. at 32).

Even though Verizon defends its proposed 12.6 percent cost of capital on the basis that it is in line with the 12.16 percent cost of capital adopted by the Department in 1996 in Phase 4, AT&T asserts that this ignores the fact that the FCC in the Massachusetts 271 Order expressed serious concerns that the current Department-adopted cost of capital was excessive. In addition, AT&T contends that every state in the Verizon-East region that has addressed this issue recently has adopted a cost of capital far below what Verizon proposes in this case (id. at 31-32).

Next, AT&T argues that the difference between its proposed weighted cost of capital and Verizon's is explained by the excessive and unsupportable 14.75 percent cost of equity, 7.55 percent cost of debt, and 25/75 percent debt to equity capital structure assumed by Verizon (AT&T Brief at 11). AT&T asserts that Verizon's most significant error was its use of a single-stage DCF model that unreasonably assumes that Verizon will continue to grow at a rate significantly above the growth rate of the U.S. economy. Use of the model, according to AT&T, has caused Verizon to overstate its cost of equity by 371 basis points and its cost of capital by 278 basis points (id. at 16, 17).

In comparison, AT&T claims that its model reasonably assumes that Verizon's growth may outpace the rest of the economy for 20 years, but thereafter can only be expected to equal the growth rate of the U.S. economy (id. at 16). AT&T contends that its three-stage growth pattern for a telecommunications firm with Verizon's growth tracking is clearly a more plausible application of the DCF method and also is consistent with the nearly universally accepted principle that multi-stage models should be used when evaluating companies whose growth rate exceeds that of the economy as a whole (id. at 17).

Moreover, according to AT&T, Verizon's errors are compounded by the fact that Verizon overstates the risk it faces by assuming the same risk as the S&P Industrials (id. at 16). AT&T argues that Verizon's use of the S&P Industrials conflicts with FCC guidelines, rational investor expectations, and common sense because the S&P Industrials comprise firms that face vastly different risks and opportunities (id. at 19). According to AT&T, the S&P Industrials list has dropped companies that have experienced poor or negative growth in the past few years, resulting in an upward bias of the composite growth rate (id.). AT&T further states that almost all state commissions in the Verizon-East region that have considered Verizon's proposal have rejected it (id. at 22). More specifically, AT&T notes that the Maine Public Utilities Commission ("PUC") found that the S&P Industrials are not a reasonably comparable group of companies, because the business risk inherent in their operations generally exceeds the risk faced by a provider of UNEs, and their forecast growth rates are well above what would be expected for providers of largely monopoly services (id. at 23). Similarly, AT&T claims that the Vermont Public Service Board found that the business of selling network elements should present relatively low risks in the intermediate term (id.).

AT&T argues that the risk faced by THCs, in comparison, reflects the wholesale UNE market more accurately than the S&P Industrials (id. at 16). Such firms, according to AT&T, which are in the business of providing competitive telecommunications services, can be expected to face similar risks to those faced by Verizon, and thus serve as superior proxies for estimating the cost of equity capital to Verizon (id. at 19). AT&T states that the choice between S&P Industrials and THCs account for as much as 40 basis points (id. at 23).

Finally, AT&T claims that Verizon's test of reasonableness of the three-stage DCF model is flawed (AT&T Reply Brief at 46). AT&T argues that Verizon's witness Dr. Vander Weide's analysis shows that he is not consistent regarding his position on sample size (id.). According to AT&T, Dr. Vander Weide indicated that four or five companies will not yield an accurate cost of capital, presumably because of measurement error, yet he is comfortable using an average of only three natural gas distribution companies for ranking purposes (id.). Moreover, AT&T points out that Dr. Vander Weide's electric companies group is composed of companies that are involved in electric, gas, nuclear energy, telecommunications, real estate, financial services, and international business, no longer making them low risk (id. at 46-47).

c. WorldCom

WorldCom claims that Verizon's cost of capital is too high and inflates Verizon's recurring costs (WorldCom Brief at 7). WorldCom argues that, because the provision of local telephone service is capital intensive, excessive capital costs will deter competition, encourage inefficient construction of bypass facilities by entrants, and generate improper subsidies for the ILEC (id. at 8). Like AT&T, WorldCom also notes the FCC's concern, in its Massachusetts 271 Order, regarding, among other things, the Department-approved cost of capital of 12.16 percent for Verizon (id.).

With regard to risks, WorldCom contends that for UNE pricing, the allowed cost of capital must reflect only the risks of providing the network elements, and not the higher risks of providing retail-related costs (id.). WorldCom argues that, contrary to the Department's finding in the Consolidated Arbitrations, the TELRIC standard does not require the presumption that the business of supplying UNEs faces a high degree of competitive risk (id. at 11). Rather, WorldCom asserts, the FCC's Local Competition Order at ¶ 702 makes it clear that incumbent LECs bear the burden of demonstrating with specificity the competitive risks they will actually face (id.). Moreover, WorldCom argues that there is no legal inconsistency between the FCC's standards contained in ¶ 702, which require an inquiry into the level of competition that Verizon actually faces, and the other elements of the TELRIC standard set forth in the Local Competition Order (WorldCom Reply Brief at 19). Indeed, WorldCom claims, it is commonplace for rate regulators to base rates on the costs that would prevail in an effectively competitive (or contestable) market, while limiting returns to the levels needed to compensate the regulated firm for the risk it actually faces (id. at 19-20).

WorldCom further argues that Verizon's actual risk in the provision of UNEs is virtually nonexistent because the business risks Verizon actually faces as a wholesale supplier of UNEs are low and will remain low for the foreseeable future (id. at 25). WorldCom states that "the collapse of the CLEC sector, coupled with the rosy financial projections offered by Verizon's own executives, render the company's self-portrait of a beleaguered competitor not credible" (id.).

Accordingly, WorldCom recommends that the Department approve the cost of capital methodology and results advocated by Mr. Hirshleifer, AT&T and WorldCom's witness, because: (1) the three-stage DCF model is more compelling than Verizon's single-stage model; and (2) the selection of regional THCs and the debt-to-equity capital structure of these companies is more appropriate than Verizon's use of the S&P Industrials (WorldCom Brief at 15).

d. CLEC Coalition

The CLEC Coalition supports the cost of capital advocated by AT&T as an appropriate input for deriving UNE rates (CLEC Coalition Brief at 19). The CLEC Coalition states that the reasonableness of AT&T's proposed cost of capital is shown by the 8.82 percent cost of capital recently ordered by the New Jersey BPU and the 8.42 cost of capital the New Hampshire Public Utility Commission requested as a condition to providing Verizon a favorable Section 271 recommendation to the FCC (id.).

e. DOD/FEA

The DOD/FEA urges the Department to reject Verizon's capital structure. It contends that the capital structure that is in Verizon's year 2000 annual report supports a mix of 55 percent debt and 45 percent equity based on the Verizon's long-term debt of $42.5 billion and stockholders' investment of $34.6 billion at the end of the year 2000 (DOD/FEA Brief at 7). According to the DOD/FEA, since the above capital structure is based on the consolidated financial results of Verizon's entire operations, the domestic telecommunications segment would have a greater debt-to-equity ratio because the activities at issue in this proceeding are the most regulated, least competitive, and least risky of all (id. at 8). The FEA indicates that other agencies, such as the Vermont Public Service Board and the Administrative Law Judge presiding over the UNE case in New York, declined to set UNE charges with capital structures reflecting only market-based weights (id. at 9). Accordingly, the DOD/FEA urges the

Department to prescribe a capital structure of 40 percent debt and 60 percent equity (id. at 9-10).

3. Analysis and Findings

In this proceeding, we are required to establish the forward-looking cost of capital for Verizon based on the forward-looking TELRIC methodology. The FCC provides us with guidance concerning the appropriate cost of capital to be used in TELRIC cost studies. In the Local Competition Order, the FCC states:

> Based on the current record, we conclude that the currently authorized rate of return at the federal or state level is a reasonable starting point for TELRIC calculations, and incumbent LECs bear the burden of demonstrating with specificity that the business risks that they face in providing unbundled network elements and interconnection services would justify a different risk-adjusted cost of capital or depreciation rate. These elements generally are bottleneck, monopoly services that do not now face significant competition. We recognize that incumbent LECs are likely to face increased risks given the overall increases in competition in this industry, which generally might warrant an increased cost of capital, but note that, earlier this year, we instituted a preliminary inquiry as to whether the currently authorized federal 11.25 percent rate of return is too high given the current marketplace cost of equity and debt. On the basis of the current record, we decline to engage in a time-consuming examination to determine a new rate of return, which may well require a detailed proceeding. States may adjust the cost of capital if a party demonstrates to a state commission conducting a "rate-of-return or other rate based proceeding." We note that the risk-adjusted cost of capital need not be uniform for all elements. We intend to re-examine the issue of the appropriate risk-adjusted cost of capital on an ongoing basis, particularly in light of the state commissions' experiences in addressing this issue in specific situations.

Local Competition Order at ¶ 702.

The FCC further states that "because a pricing methodology based on forward-looking costs simulates the conditions in a competitive market place, it allows the requesting carrier to produce efficiently and to compete effectively, which should drive retail prices to their competitive levels." Id. at ¶ 679. In addition, the FCC held that "[t]he forward-looking costs of capital (debt and equity) needed to support investments required to produce a given element shall be included in the forward-looking direct cost of that element." Id. at ¶ 691.

In the Phase 4 Order, where the Department first addressed the issue of cost of capital in a TELRIC environment, the Department noted that "the cost of capital demanded by investors is related to the level of risk anticipated by those investors compared to other investments in the marketplace." Phase 4 Order at 38. The Department found that Verizon (then NYNEX) was under no obligation to prove that there were competitive inroads to its existing monopoly, stating that "we are conducting a forward-looking cost study and in so doing are attempting to estimate an appropriate cost of capital in the marketplace that will develop upon the signing of interconnection agreements." Id. at 41. Moreover, the Department stated that the competition experienced by Verizon at that time for the provision of UNEs was simply not a relevant indicator of the broadly expanded competitive marketplace envisioned by the Act. Id. Thus, as we did in the Phase 4 Order, the Department must determine whether "the level of business risk faced by [Verizon] with regard to the provision of unbundled network elements is higher than that which would apply to a monopoly bottleneck facility, a facility that, by definition, is not subject to bypass." Id. at 44. This bypass occurs when CLECs serve customers primarily using the CLECs' own facilities. In terms of competitive risk for Verizon, it does not matter whether a facilities-based CLEC or other provider competes in the provision of UNEs as a wholesale product or competes only for end-use customers; it only matters whether the loss of a customer could leave Verizon with stranded network investment. Thus, Verizon's capital risk for purposes of a TELRIC study will include competitive risks from facilities-based competition, but will not include competitive risks from UNE-based or resale competition.

The record indicates that six years after the Phase 4 Order, there is significant network-based competition in the market for local exchange services in Massachusetts, and there is a stable trend of increases in this competition (Exh.VZ-3, at 27-35; RR-DTE-1; RR-DTE-2; RR-DTE-3). For example, Verizon has signed and the Department has approved 70 interconnection agreements with facilities-based CLECs since 1996; CLECs have obtained at least 1,600 collocation arrangements throughout the state; and 166 of Verizon's wire centers are equipped with collocation arrangements. In addition, as of December 2001, CLECs served 1,112,100 lines in the state. 841,200 of these CLEC lines are facilities-based lines, UNE loops, or special access arrangements (Exh.VZ-3; RR-DTE-1; RR-DTE-3). While Verizon has deployed 9,603 miles of fiber, as of year end 2000, CLECs have deployed over 2,175 miles of fiber and at least 22 local switches in Massachusetts (RR-DTE-1(c)).[37] The record also indicates that wireless service is increasingly being used as a substitute for local exchange landline service (Exh.VZ-3, at 29, 33).

Turning to the mechanics of setting a TELRIC cost of capital, we note that the parties agree that their proposals on the cost of equity are the primary reason for the wide disparity between Verizon and AT&T's estimates of the cost of capital. As stated earlier, Verizon's estimate of the cost of equity is based on a single-stage DCF model that uses the S&P

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[37] Moreover, although disruption in the telecommunications industry, including bankruptcies of many CLECs, has reduced the number of CLECs operating in Massachusetts, Verizon's market share in the business market has continued to decrease. D.T.E. 01-31-Phase I at 79.

Industrials as a proxy group, representing the business risks facing Verizon in providing UNEs. AT&T, on the other hand, uses a weighted average of the three-stage DCF model and the capital asset pricing model ("CAPM"), using the THCs as the comparison group.

First, we address the issue of the appropriate proxy comparison group. In the Phase 4 Order, the Department stated that the comparison group presented by AT&T and WorldCom (i.e., the THCs) "while similar in whole to NYNEX, do[es] not fully reflect the specific risk factors inherent in the provision of unbundled network elements." Phase 4 Order at 48. Instead, the Department adopted Verizon's proposal for the S&P Industrials. Id. In this case, the CLECs again argue that the risks faced by the THCs reflect the wholesale UNE market more accurately than the S&P Industrials. The evidence and arguments presented by the CLECs, very similar to that which they presented in Phase 4, do not persuade us to change our findings. AT&T and WorldCom's proxy group is based on a quite limited group of companies, too small to calculate an accurate estimate of the cost of capital. Moreover, this limited group consists of telephone holding companies that can diversify away many of the technology risks that Verizon faces in a competitive local exchange market. Verizon's regulated telephone subsidiary in Massachusetts is not so placed. As the Department stated in the Phase 4 Order, the relative risk of other parts of Verizon's business or the company as whole are not at issue. Rather, the issue then and now is to determine the relative risk of Verizon as a stand-alone UNE provider.

In this proceeding, Verizon has provided sufficient evidence that it faces significant actual and potential competition from facilities-based CLECs and from alternative-technologies providers, including data providers, cable operators, and wireless carriers, and that this competition is likely to increase in the next few years (Exh.VZ-3, at 27-34; RR-DTE-1; RR-DTE-2; RR-DTE-3). These companies offer alternative methods of providing voice and data services that are being used to bypass the local loop and will continue to on a going forward basis and could leave Verizon with stranded investment (Exh.VZ-3, at 27-34; RR-DTE-1; RR-DTE-2; RR-DTE-3). The wholesale business risk, therefore, is real and will likely increase over time. A limited comparison group of just telephone holding companies that can diversify away many of the technology risks that Verizon faces in a competitive local exchange market does not represent Verizon's going forward wholesale business risk, whereas the S&P Industrials do represent that risk because they represent the risks of competitive organizations, against which it is reasonable to compare the likely risk of building and leasing UNEs. Accordingly, the Department finds that the S&P Industrials is an appropriate and reasonable proxy group.

With regard to the cost of debt, Verizon's and AT&T's proposals are very close, 7.55 percent and 7.86 percent, respectively. Both parties indicate that because the spread between the two estimates is small, the decision to select one instead of the other will have a de minimis effect on Verizon's overall cost of capital (Tr. 1, at 44; AT&T Brief at 23). However, AT&T persuasively argues that both estimates are likely to be conservatively high since both estimates exclude short-term debt and are based on Verizon's operations as a whole (AT&T Brief at 23-24, citing Exh. ATT-1, at 8-9). Therefore, the Department will use the lower of the two estimates and finds that 7.55 percent is an appropriate cost of debt for use in this case.

Concerning capital structure, since we find above that the S&P Industrials represent a reasonable proxy group, we also find that the capital structure proposed by Verizon – 25 percent debt and 75 percent equity – is appropriate and reasonable, because it is based on a review of market value capital structures data for both the proxy group of S&P Industrials and a group of telecommunications companies with incumbent local exchange subsidiaries for the five-year period 1996 through 2000.[38] The data show that both groups, on average, have at least 75 percent equity in their capital structure. In addition, Verizon's proposed capital structure is in line with our finding of a capital structure of 23.51 percent debt and 76.49 percent equity in our Phase 4 Order at 53.

We now turn to the issue of whether either the single-stage DCF model proposed by Verizon or the three-stage model proposed by AT&T and WorldCom are appropriate for use in calculating the cost of equity. In the past, the Department has addressed the DCF analysis as a basis for determining an appropriate rate of return on equity ("ROE"). See Massachusetts Electric Company, D.P.U. 95-40, at 96-97 (1995); Boston Gas Company, D.P.U. 93-60, at 250-251 (1993). A DCF model postulates that the value of an asset is equal to the present value of future expected cash flows discounted at the appropriate risk-adjusted rate of return. Because the dividend yield and growth rate components of this risk-adjusted rate of return are variables that reflect investors' expectations of future performance of stock investment, there always will be potential problems and limitations in estimating the appropriate values of these two variables. Regarding the growth component of the DCF, the Department has rejected those adjustments that overstate either the dividend yield or the growth component and, consequently, the DCF-based cost of equity.

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38 We also reject the cost of capital proposed by the DOD/FEA because it relies on a historical book value capital structure that is not consistent with the forward-looking principles mandated by the FCC's TELRIC methodology.

To support its three-stage DCF model, AT&T presents evidence and arguments similar to the ones it presented in Phase 4 of the Consolidated Arbitrations. There, the Department found that the result achieved using AT&T's three-stage DCF model "is not consistent with our overall findings regarding the level of risk associated with the provision of unbundled network elements." Phase 4 Order at 48; Phase 4-A Order at 5. In the Phase 4-A Order at 6, the Department, after running the three-stage model, stated that "the use of the multi-stage model produces results that are not reasonable, given our more qualitative findings concerning the relative risk of providing unbundled network elements" and determined that it would not require that the multi-stage model be used to determine the cost of equity for the TELRIC study in that case. For the following reasons, AT&T has not persuaded us to depart from our precedent.

In this proceeding, Verizon conducted several tests of reasonableness of AT&T and WorldCom's three-stage DCF model. The record indicates that the three-stage DCF model results in high-risk companies having a lower cost of equity than low-risk companies, a result that is inconsistent with investor expectations (Exh.VZ-4, at 82-87). For example, using the three-stage DCF model, Verizon found that electric and natural gas distribution companies, which we consider to be less risky, have a higher cost of equity than industrial companies (id. at 83-86; Tr. 1, at 110). Moreover, we find that AT&T did not provide sufficient quantitative analysis to counter Verizon's test of reasonableness of the three-stage DCF model. AT&T attempts to address Verizon's test of reasonableness in its reply brief, arguing that Verizon's test is flawed because it is based on only a small number of utility companies that are involved in several businesses other than gas and electric distribution, which makes them no longer low-risk companies. However, AT&T failed to provide evidence to support its general claim and to counter Verizon's analysis.

The Department is not persuaded, however, that Verizon's single-stage DCF model produces a reasonable, forward-looking cost of equity. We agree that Verizon's DCF model uses a growth component that unreasonably assumes that Verizon will continue to grow at a rate significantly above the growth rate of the U.S. economy, ultimately resulting in the entire U.S. economy consisting of telecommunications companies. A cost of equity based on this unrealistic foundation lacks credibility. Based on the above considerations, the Department finds that Verizon's DCF analysis overstates the required return on equity.

In terms of AT&T's CAPM analysis, the Department has rejected the use of the CAPM as a basis for determining a utility's cost of equity. See Berkshire Gas Company, D.T.E. 01-56, at 110 (2002); Massachusetts Electric Company, D.P.U. 92-78, at 113 (1992); Boston Gas Company, D.P.U. 88-67, Phase I at 184 (1988); Colonial Gas Company, D.P.U. 84-94, at 63-64 (1984). The Department has noted a number of limitations in the application of CAPM, including the definition and data used to estimate the risk-free rate, and the coefficient of determination of beta. See Boston Gas Company, D.P.U. 93-60, at 257 (1993). The Department finds that the same deficiencies inherent in any CAPM analysis and identified in prior cases are present here. Accordingly, we will place little weight on the results of the CAPM analysis.

The parties have presented various financial methods, such as the DCF and the CAPM, in support of their calculation of an appropriate return on equity. These methods include the use of historical and projected growth rates, the use of historical, current, and projected interest rates, and capitalization and financial statistics. However, the use of these empirical analyses in this context is not an exact science. A number of judgments are required in conducting a financial model-based ROE analysis. One looks for substantial, reliable evidence on which one may reasonably base a judgment. The first layer of judgment involves the appropriate economic theory underlying each model. Next, we must choose which of several competing models offered by the parties to a proceeding best represents market conditions. In addition, there is significant qualitative judgment involved in the selection of appropriate data to apply to the chosen model. Cape Cod Gas Company, D.P.U. 637/638, at 50 (1981). Finally, we must apply to the record evidence and argument considerable judgment and agency expertise to determine the appropriate use of the empirical results. Each level of judgment to be made contains the possibility of inherent bias and other limitations. Western Massachusetts Electric Company, D.P.U. 18731, at 59 (1977). Therefore, while the results of analytical models are useful, the Department must ultimately apply its own judgment to the evidence to determine an appropriate rate of return.

In addition to the financial models mentioned above, the Department has considered various factors in setting an appropriate return on equity, including our assessment of forward-looking competitive risk, the growth rates on a number of economic indicators, and the range of returns on equity granted in recent Department rate cases and TELRIC analysis. Our task is not a mechanical or financial model-driven exercise. Western Massachusetts Electric Company, D.P.U. 160, at 59 (1980); D.P.U. 18731, at 59 (1977); see also Boston Edison Company v. Department of Public Utilities, 375 Mass. 1, 15 (1978). While the Department has placed limited value on both the risk premium and CAPM methods, we have found more value in the use of the DCF model for determining an appropriate ROE. Fitchburg Gas and Electric Light Company, D.T.E. 99-118, at 89 (2001).

While we have found faults with both Verizon's and AT&T's specific DCF models, we note that the range of equity returns produced by these models provides some guidance for our judgment in setting an appropriate forward-looking return on equity for use in a TELRIC model. AT&T proposed a ROE of 10.42 percent (Exh. ATT-1; Exh. ATT-2; Exh. ATT-3), while Verizon proposed a ROE of 14.75 percent (Exh. VZ-3; Exh. VZ-4; Exh. VZ-5). Based on the results of the DCF analyses and our assessment of the level of risk anticipated by investors compared to other investments in the marketplace, the Department finds that a ROE of 12.75 percent is reasonable. This cost of equity is 75 basis points lower than the cost of equity established in the Consolidated Arbitrations. This reduction is in response to guidance from the FCC and to our assessment of network-based competition in Massachusetts. While network-based competition in the Commonwealth is significant and is likely to grow, it has not developed at the pace that we expected in 1996. In particular, we did not foresee the development and importance of the UNE-Platform ("UNE-P") as an entry strategy for some of the largest and most experienced carriers. Also, the investment climate for telecommunications companies today and into the future suggests that network-based competition may be held back somewhat by constraints on the availability of capital, which most likely will be easier to obtain by incumbent telephone companies than it will be by CLECs. Accordingly, for all of the above reasons, the Department approves a weighted cost of capital of 11.45 percent, resulting from a capital structure of 25 percent debt and 75 percent equity, a 7.55 percent cost of debt, and a 12.75 percent cost of equity.

Finally, regarding the FCC's reservations stated in the Massachusetts 271 Order concerning Verizon's existing 12.16 percent UNE cost of capital, we note that the FCC specifically stated that:

> The Massachusetts Department utilized a cost of capital of 12.16 percent. This is higher than the cost of capital that the Massachusetts Department has used in setting Verizon's local rates and substantially higher than the cost of capital employed by any of the other states in Verizon's region . . . We question whether this relatively high cost of capital is sufficiently justified by state specific factors. We note, however, the Massachusetts Department is reviewing this input as part of its current rate case, and, as discussed below, we find that Verizon's loop rates fall within a reasonable TELRIC range.

Massachusetts 271 Order at ¶ 38.

Given the time constraints of a Section 271 proceeding, the FCC did not conduct an in-depth analysis to reach these conclusions. Rather, the FCC's cost of capital analysis is based simply on a comparison of Verizon's approved TELRIC cost of capital to the cost of capital we used to assess the reasonableness of Verizon's Massachusetts retail rates in 1995 and the UNE cost of capital employed by some other states in Verizon's region for TELRIC analyses. First, the Department's analysis of cost of capital in the 1995 case was specifically predicated on the assumption that we were evaluating a retail monopoly – not a competitive retail market. In that decision, the Department determined that a cost of capital of 9.73 percent reflected the risk of investment in a telephone company with a retail monopoly in 1995, and we believe that a cost of capital of 11.45 percent accurately reflects the forward-looking risk of investment in Verizon in Massachusetts in 2002 for TELRIC purposes under the competitive conditions created by the 1996 Act.

Moreover, as indicated by the FCC, "states may adjust the cost of capital if a party demonstrates to a state commission that either a higher or lower level of cost of capital is warranted." Local Competition Order at ¶ 702. As such, after reviewing the record evidence, and consistent with the FCC directives, the Department has determined, above, that network-based competition in Massachusetts is underway and will intensify in the future, requiring the Department to use a cost of capital in line with what competitive industries presently use. Our analysis is a state-specific analysis, based only on the competitive conditions in Massachusetts. It would be inappropriate to judge the reasonableness of Verizon's cost of capital in this proceeding based on the cost of capital employed in any other state in Verizon's region, because those states have based their determinations on the competitive conditions in their particular state, which in some cases are similar and in some cases are dissimilar to conditions in Massachusetts. The determination of cost of capital is the domain of the individual state commission. As the Supreme Court noted, TELRIC methodology "prescribes no fixed percentage rate as risk-adjusted capital costs and recognizes no particular useful life as a basis for calculating depreciation costs. On the contrary, the FCC committed considerable discretion to state commissions on these matters." 122 S.Ct. at 1677, citing Local Competition Order at ¶ 702.

B. Depreciation

1. Introduction

Depreciation is the rate at which companies are allowed to recover the cost of their investment annually. The FCC stated that the construction of a forward-looking cost study for UNEs requires a determination of the appropriate depreciation rates. Local Competition Order at ¶ 702. The two inputs in determining economic depreciation rates are the economic life and future net salvage value of the investment in question. In its costs studies in this proceeding, Verizon used the economic lives and future net salvage values that it used in its 1999 financial reports to its shareholders. The CLECs argue that Verizon should use the FCC-prescribed lives upon which its current rates are based.

2. Position of the Parties

a. Verizon

Verizon proposes depreciation lives that conform with generally accepted accounting principles ("GAAP") in its cost studies (Verizon Brief at 27). Verizon claims that its GAAP lives are TELRIC compliant because they reflect the principle that the economic life of an asset may be shorter than its physical life due to technological changes, competition, and other factors (id.). Verizon states that, according to GAAP, depreciation rates are reassessed annually to ensure that the depreciable lives correctly reflect relevant events and circumstances (id.). Verizon indicates that, although the Department adopted FCC-prescribed lives for UNEs in 1996 in the Consolidated Arbitrations, which Verizon argues could be found to be forward-looking, significant changes have taken place in technology, competition, and the regulatory environment that have had a major effect on depreciation lives, which the FCC simply could not have accurately foretold (id. at 27-28). Verizon argues that the CLECs neglect to explain the critical failure of their depreciation lives to account for a fully competitive market and provide no explanation of how use of the 1996 FCC lives is consistent with TELRIC (Verizon Reply Brief at 16). According to Verizon, lives used and set years ago for regulatory accounting purposes are irrelevant and are not TELRIC-compliant (id. at 18). Verizon claims that the FCC, in a reply filed with the United States Supreme Court in the appeal of the FCC's TELRIC methodology, recognized that depreciation lives under TELRIC must accommodate reasonable economic assumptions about future technological advances and the effect those advances will have on the value of current assets (Verizon Brief at 28).

Moreover, Verizon argues that, while state commissions may consider FCC prescribed lives in determining TELRIC depreciable lives, they should not rely on such lives to the exclusion of evidence of competition and change that dictate different lives (id.). According to Verizon, the FCC in its 1999 prescriptions for Verizon's former GTE companies established shorter lives than the 1996 lives it prescribed for Verizon in Massachusetts (id.). Verizon states that the FCC in recent Section 271 decisions has approved the use of GAAP lives by SBC in Kansas and Oklahoma and by Verizon in Pennsylvania (id. at 34). Verizon states that since companies use GAAP lives for financial reporting purposes, they have no incentive to understate lives because shorter depreciable lives produce higher expenses and lower net income, which would have negative implications for the company's stock price, borrowing costs, and management compensation decisions (id. at 35). The company states that the reasonableness of the GAAP lives is confirmed by their comparability to the lives adopted by its competitors and others in the industry (id.).

Verizon argues that AT&T, WorldCom, and the CLEC Coalition's proposed depreciation lives are backward looking and inconsistent with TELRIC (id. at 30). The lives recommended by AT&T, WorldCom, and the CLEC Coalition, Verizon asserts, fail to account for the hypothetical TELRIC construct and the very real impact that current and expected technological changes and competition have had on the depreciable lives of telecommunications technology to date (id. at 31).

Moreover, contrary to AT&T's argument, Verizon claims that it did not seek FCC re-prescription because its status as a price-cap carrier gives Verizon no incentive to do so (id. at 32). With regard to depreciation reserve, Verizon claims that depreciation reserve increases as the depreciated asset ages and increases because of the addition of new assets with shorter lives (id.). Thus, according to Verizon, increases in its depreciation reserve present no reason to assume that the 1996 lives are forward-looking (id. at 32-33).

b. AT&T

AT&T recommends that the Department adopt the lives specifically prescribed for Massachusetts by the FCC (AT&T Brief at 25). AT&T claims that Verizon is attempting to inflate projected UNE costs by using unreasonably short depreciation lives (id.; AT&T Reply Brief at 50-51). According to AT&T, the overwhelming majority of the states considering this issue have rejected Verizon's proposals and adopted the FCC's forward looking, state-specific depreciation lives (AT&T Brief at 25; AT&T Reply Brief at 56). For example, AT&T claims that the Maine Public Utilities Commission recently rejected Verizon's proposals, finding that the FCC lives and resulting rates are the best indicator of the economically useful lives of newly installed equipment that will be used to provide service to end-users or UNEs to competitors (AT&T Brief at 25). Similarly, AT&T states that the New Jersey Board, the Vermont Public Service Board, the Rhode Island Public Utilities Commission ("PUC"), as well as 20 other states that have dealt with the depreciation issue in recent years have rejected the position that Verizon asserts in this case (id. at 25-26). AT&T notes that the Rhode Island ruling[39] adopting FCC-prescribed lives is of particular interest because Verizon, in a joint

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[39] See In re: Review of Bell Atlantic-Rhode Island TELRIC Study, Rhode Island PUC
(continued . . .)

declaration with the Rhode Island PUC submitted to the FCC in connection with Verizon's Section 271 application, has admitted to the FCC that the Rhode Island Commission's decision was reasonable and complied with TELRIC principles (id. at 26).

AT&T argues that, contrary to Verizon's claim, the FCC lives are not outdated and are still appropriate for use today (id. at 27; AT&T Reply Brief at 48-49). AT&T contends that if Verizon truly believed that the FCC's Massachusetts-specific prescribed lives were outdated, Verizon could have sought re-prescription but did not, because it feared and indeed expected that the FCC would reject any effort by Verizon to substitute shorter lives for Massachusetts (AT&T Brief at 28). According to AT&T, Verizon continues to use the FCC's 1996 prescribed lives for Massachusetts for regulatory purposes, including using those lives for ARMIS reporting and for calculating its interstate rate of return (id.).

Moreover, AT&T states that, although the FCC originally prescribed the lives in 1995, the FCC reviewed its prescribed life ranges in 1999 and, at that time, expressly found that its prescribed lives were appropriate for use by state commissions for determining the appropriate depreciation factors for use in establishing high-cost support, and interconnection and UNE rates (id. at 27). Furthermore, AT&T states that in the Consolidated Arbitrations the Department found that the FCC's re-prescription was based on a forward-looking orientation, including current technological developments and trends (id. at 29). AT&T states that empirical data showing increases in the depreciation reserve levels both for local exchange companies in general and for Verizon in particular confirm that the FCC employs a forward-

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(. . . continued)

Report and Order, Docket No. 2681 (November 18, 2001) (Exh. ATT-11).

looking analysis (id.). According to AT&T, the depreciation reserve level for Verizon has risen from 39.8 percent in 1991 to 53.8 percent in 2000, despite a growth rate in plant of over 50 percent (id.). Additionally, AT&T claims that depreciation rates have averaged 7.1 percent over the last ten years, while its retirement rates have averaged only 3.4 percent (id.). If the FCC were prescribing depreciation rates based on historical indicators, AT&T states, it would set those rates in the range of three to five percent instead of seven percent, which further confirms the forward-looking nature of the FCC prescriptions (id. at 29-30).

Lastly, AT&T maintains that Verizon has submitted no credible evidence that technological innovations and competition will decrease the useful lives of its plant (id. at 30). To the contrary, AT&T claims that Verizon's witness testified with regard to DSL that such technology would extend the economic life of Verizon's embedded copper loop plant by using that plant to provision high-speed digital services (AT&T Reply Brief at 52).

c. WorldCom

WorldCom argues that Verizon has failed to prove that its depreciation lives and net salvage values are more appropriate than the FCC lives in place today (WorldCom Reply Brief at 14). WorldCom states that while there may be valid reasons why the FCC prescribed shorter depreciation lives for the GTE companies and why the FCC approved the use of GAAP lives for SBC in Kansas and Oklahoma and Verizon in Pennsylvania, Verizon cannot bootstrap on those decisions without providing state-specific reasons why this jurisdiction also warrants shorter depreciation lives (id. at 15).

WorldCom claims that the depreciation lives adopted by the Department in 1996 are as valid today as they were when originally set through the FCC's rigorous review process, and, therefore, should be adopted for purposes of this proceeding (WorldCom Brief at 18). Like AT&T, WorldCom argues that the usefulness of the current FCC lives remains valid because the empirical evidence shows that the depreciation process results in adequate depreciation accruals and that Verizon offered no evidence to show that the economic lives of Verizon's Massachusetts assets are shorter than what the FCC's analysis found (id.). WorldCom argues that, contrary to Verizon's assertions, GAAP accounting is conservative in nature and is designed to protect investors against overstated asset values and overstated earnings (id.). According to WorldCom, the Rhode Island PUC found that depreciation lives and methods used for financial reporting, which are strongly influenced by the tax laws, bear no close relationship to the economic lives of assets for regulatory or ratemaking purposes (id. at 19).

d. CLEC Coalition

The CLEC Coalition supports the depreciation lives advocated by AT&T as the appropriate input for deriving UNE rates (CLEC Coalition Brief at 19).

3. Analysis and Findings

The FCC stated that the construction of a forward-looking cost study for UNE requires a determination of the appropriate depreciation rates. Local Competition Order at ¶ 70. AT&T, WorldCom, and the CLEC Coalition propose that Verizon use the FCC-prescribed lives that the Department adopted for UNEs in 1996. Verizon, on the other hand, proposes that the Department approve the use of GAAP lives.

In the Phase 4 Order, Department adopted the projection lives prescribed by the FCC in its last Massachusetts represcription of Verizon's depreciation rates in 1996, finding that such lives were the kind of forward-looking projection lives required in a TELRIC study. Phase 4

Order at 55-56. The FCC has endorsed depreciation lives based on GAAP as well as its own prescribed depreciation lives (Exh.VZ-7, at 1), and the FCC recently noted the need to adopt depreciation lives that reflect the reality of the changes taking place in the telecommunications industry and for state commissions to determine specific depreciation rates that best reflect the competitive situation in their respective states (Exh.VZ-55, at 11)[40] (stating that FCC has not prescribed particular depreciation schedules for network elements, but has left it to state PUCs "to determine how best to adopt specific depreciation rate adjustments that reflect expected asset values over time").

Below is a table[41] comparing Verizon's proposed lives for major categories of telecommunications plant to: (1) the 1996 FCC-prescribed lives for Massachusetts; (2) the 1999 FCC approved high/low ranges for all ILECs; and (3) the 1999 average FCC prescribed lives for Verizon's former GTE companies.

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[40] Exh. VZ-55 is the Reply Brief of FCC, 122 S.Ct. 1646.

[41] Source: Columns a and b: Exh. VZ-6, exh. AES-1; Columns c and d: FCC 1998 Biennial Regulatory Review – Review of Depreciation Requirements for Incumbent Local Exchange Carriers, CC Docket No. 98-137, Report and Order, and United States Telephone Association's Petition for Forbearance from Depreciation Regulation of Price Cap Local Exchange Carriers, Memorandum Opinion and Order in ASD 98-91, FCC 99-397 (rel. December 30, 1999) ("1998 Biennial Review of Depreciation Requirements"); Column e: RR-DTE-9.

Account	VZ-proposed (a)	FCC-MA 1996 (b)	FCC Low 1999 (c)	FCC High 1999 (d)	FCC-GTE Average 1999 (e)
ESS Digital	10	15	12	18	13
Circuit Equipment	9	11	11	13	11
Aerial Cable Metallic	18	22	20	26	20.8
Underground Cable M.	18	25	25	30	25
Buried Cable Metallic	18	23	20	26	20.3
Fiber Cable	20	25	25	30	25

For the reasons discussed below, we reject both Verizon's proposal to use GAAP lives and the CLECs' proposal to use the 1996 FCC-prescribed depreciation lives for Verizon in Massachusetts, and instead adopt the low range of the 1999 FCC-prescribed depreciation for all ILECs. The use of GAAP lives would overstate costs. On this point, we find the FCC's rationale in its 1998 Biennial Review of Depreciation Requirements persuasive. Regarding GAAP, the FCC states that any depreciation lives shorter than what is prescribed within its high/low range, could have a substantial harmful impact on competition because the ILECs "could independently establish depreciation rates that could result in unreasonably high interconnection and UNE rates, which competitors would be compelled to pay in order to provide competing local exchange service." 1998 Biennial Review of Depreciation Requirements at ¶ 28. More specifically, in that Order, the FCC states that:

> An incumbent LEC using GAAP would have substantial latitude to select different methods of depreciation, such as accelerated depreciation, that could significantly alter the depreciation expense that the LEC could claim. Additionally, the Commission has previously rejected the incumbent LECs' argument, stating that "GAAP is guided by the conservatism principle which holds, for example, that, when alternative expense amounts are acceptable, the alternative having the least favorable effect on net income should be used." The Commission concluded that, although conservatism is effective in protecting the interests of investors, it may not always serve the interests of ratepayers, and did not offer adequate protection for ratepayers in the case of depreciation

> accounting. We are not persuaded that the role of the conservatism principle in GAAP has changed or that we should change our previous decision. Incumbent LECs contend that the other principles of GAAP are sufficient to protect the interests of ratepayers. We believe that giving incumbent LECs the right to select, for regulatory purposes, any depreciation rate allowed by GAAP is inappropriate as long as incumbent LECs reserve the right to make claims for regulatory relief based on the increased depreciation that would result from granting them that flexibility.

Id. at ¶ 42(A)(9).

In the Order, the FCC spells out conditions under which it finds appropriate to grant a waiver of its depreciation prescriptions. According to the FCC, an incumbent LEC may request a waiver when it voluntarily:

> (1) adjusts the net book costs on its regulatory books to the level currently reflected in its financial books by a below-the-line write-off; (2) uses the same depreciation factors and rates for both regulatory and financial accounting purposes; (3) foregoes the opportunity to seek recovery of the write-off through a low-end adjustment, an exogenous adjustment, or an above-cap filing; and (4) agrees to submit information concerning its depreciation accounts, including forecast additions and retirements for major network accounts and replacement plans for digital central offices.

Id. at ¶ 25.

Verizon claims that companies that use GAAP lives for financial reporting purposes have no incentive to understate lives because such a move will have negative implications for the company's stock, borrowing costs, and management compensation decisions. While Verizon's statement may be true in terms of protecting the interests of its investors, the use of GAAP, as the FCC has noted, does not necessarily serve the interests of ratepayers. Moreover, although GAAP depreciation rates are reassessed annually to ensure that depreciation lives correctly reflect relevant events and circumstances, the UNE rates approved in this proceeding, although possibly adjusted once prior to the end of the five-year review cycle (see Section XII, below) will not be adjusted annually over the next five years to reflect the changes in depreciation rates, if any.

For the following reasons, we find that the use of FCC-prescribed lives, which we approved for Verizon's UNE case in 1996, are not appropriate inputs for an efficient, forward-looking cost model in 2002. When the Department first evaluated TELRIC models, the FCC's most recent prescribed lives for Massachusetts were less than one year old, and thus were appropriate for use in a forward-looking study done at that time. Today, those prescribed lives are over six years old, and the record in this case demonstrates that technological and market changes in the telecommunications industry over the past six years have been so significant as to render six-year-old information of far too limited value for our present purposes. The FCC-prescribed lives from 1996 are just too outdated.

Faced with two inappropriate proposals from the parties, the Department must exercise its independent judgment based on the evidence before us. For the following reasons, we find that the low end of the 1999 FCC range is reasonable and appropriate for depreciation lives in a TELRIC study for Massachusetts.

As we found in Section V.A.3 (Cost of Capital), Verizon faces significant competition from network-based local exchange companies that deploy advanced technologies. The record in this case also demonstrates that there continues to be significant change in telecommunications technology (see Section VI (Outside Plant Inputs) and Sections VII.B.7 and VII.B.8 (discussing changing traffic patterns and increasing use of the Internet). In addition, the depreciation lives must account for the fact that, under TELRIC, it is assumed that Verizon will replace its network technology every five years. See discussion above in

Section III.C (Economic Issues). Moreover, the FCC has indicated in its 1998 Biennial Review of Depreciation Requirements at ¶ 16, that its depreciation prescription ranges are "flexible enough to allow [ILECs] shorter lives and faster depreciation," which we interpret to accommodate the level of risk that Verizon will face in providing UNEs on a forward-looking basis at a TELRIC rate.[42] Using the low end of the FCC's 1999 depreciation lives accounts, to a degree that is reasonable, for the fact that those lives are now three years old.

C. Annual Cost Factors

1. Introduction

Verizon states that annual cost factors ("ACFs") are used to translate total investment into annual costs for UNEs. ACFs are ratios that represent the relationship between a subset of expenses and their associated plant account investments (ACF_{EI}[43]), relevant expenses (ACF_{COH}[44]), or total revenues (ACF_{GR}[45]). In its filing, Verizon proposes the following ACFs: (1) Depreciation, Return, Interest, and Federal Income Taxes ACF; (2) Property and Other Taxes ACF; (3) Network ACF; (4) Wholesale Marketing ACF; (5) Other Support ACF; (6)

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[42] The FCC notes that both the regulatory system and status of competition must be considered in determining of cost of capital and depreciation: "an appropriate cost of capital determination takes into account not only competitive risks as the FCC explicitly recognized, but also risks associated with the regulatory regime to which a firm is subject. The second consideration is . . . implicit in any determination of the true economic cost of capital." Exh. VZ-55 (Reply Brief of FCC, 122 S.Ct. 1646), at 12 n.8.

[43] ACF_{EI} = plant-specific expense ÷ plant-specific investment.

[44] ACF_{COH} = common overhead expenses ÷ (total expenses - common overhead expenses).

[45] ACF_{GR} = expenses for regulatory assessments and uncollectibles ÷ total revenue.

Common Overhead ACF; (7) Gross Revenue Loading ACF; and (8) Right to Use ("RTU") ACF[46] (Verizon Brief at 97-99, citing Exh. VZ-36, at 35-42, 48-53). Verizon states that it made the following generic adjustments to ACFs: (1) the numerators in the ACFs were reduced by a resale avoided-cost discount percentage, inflation, and productivity in order to make them forward-looking; and (2) similarly, the denominators in the ACFs were adjusted by a "forward-looking to current" conversion factor ("FLC") to account for a reduction in forward-looking investment (Verizon Brief at 99, citing Exh. VZ-36, at 54-62).

2. Forward-Looking to Current Conversion Factor[47]

a. Positions of the Parties

i. Verizon

Verizon argues that as the numerator in the ACFs are made forward-looking through application of technology-related efficiencies, inflation, and productivity, a similar forward-looking adjustment must be made in the ACFs' denominator with the FLC. Verizon asserts that contrary to the CLECs' claim, the FLC is not an attempt to recover embedded expenses, but rather is a necessary element to reconcile the mismatch between the ACFs' numerator and denominator. According to Verizon, its proposed 80 percent FLC is a conservative estimate confirmed by Verizon Panel's analysis of TELRIC investments, which demonstrates that Verizon's TELRIC investments are approximately 65 percent of the booked investments in

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46 The RTU ACF is addressed in Section VII.C.1, below.

47 The FLC is applied to the Network, Wholesale Marketing, Other Support, and Common Overhead ACFs. The capital-related components (depreciation, property taxes, etc.) and the Gross Revenue Loadings are not adjusted by the FLC because their associated costs are directly determined by the level of investment and the level of expenses identified respectively.

Massachusetts. Verizon argues that if any adjustment is made to the FLC calculation, it should be to decrease the FLC to 65 percent (id. at 101-103, citing Exh. VZ-36, at 59-60, Exh. VZ-38-A at 7-8).

ii. AT&T/WorldCom

AT&T argues that the FLC is nothing more than an attempt to recoup embedded network and current expenses and, thus, should be removed from all ACFs to which it is applied. AT&T contends that Verizon's FLC is inconsistent with the FCC guidance that forward-looking expenses should be calculated using up-to-date expense-to-investment ratios, and such ratios will result in a lower estimate of forward-looking expenses when the ratio is applied to lower forward-looking investments (AT&T Brief at 40, citing Inputs Order at ¶¶ 341, 346-347, 351, 365-369).

AT&T contends that as TELRIC envisions a least-cost, efficient, forward-looking, technology-based network built today, many of the embedded efficiencies will not exist in a forward-looking environment. AT&T argues that Verizon fails to recognize the fact that a shift in the design of a forward-looking network from copper to fiber will lower maintenance costs. AT&T claims that expenses can be expected to decrease in the same manner as investments, and, thus, there is no need for the FLC factor (id. at 41, citing Exh. ATT-23, at 35-38). WorldCom supports AT&T's position (WorldCom Brief at 66-67, citing Exh. ATT-23, at 34-39).

iii. CLEC Coalition

The CLEC Coalition claims that the FLC should be removed from all ACFs to which it is applied. The CLEC Coalition argues that forward-looking expenses should not be presumed to be equal to Verizon's embedded expenses, and the FLC is nothing more than an attempt by Verizon to recover its embedded costs through the back door. The CLEC Coalition argues that the FLC is not justified for the following reasons. First, Verizon did not use the FLC factor in the Consolidated Arbitrations, and there is no basis to use it now. Second, forward-looking investments should be determined in order to calculate forward-looking expenses, but Verizon did not provide its forward-looking investments until it filed surrebuttal testimony in December 2001, which is a backwards approach. Third, Verizon does not even attempt to calculate account-specific FLCs to reflect the differences in the Expense-to-Investment ratio ("E/I ratio") by asset category. Fourth, Verizon's 80 percent FLC means that the replacement cost is 80 percent of the original investment for every investment account, however, Verizon's own data in Exh. CC-VZ 7-1 show that the Current-to-Book investment ratio ("CB ratio")[48] for every major plant category is greater than 100 percent, which means that replacement costs are greater, not less, than the original costs. Fifth, Verizon's FLC fails to account for changes in network technology from predominantly copper to fiber, which has lower maintenance expenses. Finally, the CLEC Coalition's analysis of Verizon's own historical trend of the E/I ratio shows that the ratio is declining (CLEC Coalition Brief at 19-29).

iv. Z-Tel

Z-Tel argues that because TELRIC investment, unlike historical investment, requires the most efficient technology currently available, expenses will decrease from historical levels. Z-Tel claims that the application of the FLC returns expenses to a level equal to historical

48 CB Ratios are used generally to make the denominator current so that there is a consistency between the numerator and the denominator in expense-to-investment ratios, i.e., current expense ÷ current investment.

expenses, and, therefore, the FLC should be eliminated (i.e., set equal to 1.00) (Z-Tel Reply Brief at 4-5).

b. Analysis and Findings

The FCC in its Inputs Order calculates plant-specific forward-looking expenses using the following formula: $E_F = [\ E_C \div (I_B \text{ x CB})] \text{x } I_F$ (see Exh. DTE-5 (modified), attached as Appendix A to this Order). Verizon calculates plant-specific forward-looking expenses using the following formula: $E_F = [E_F \div (I_C \text{ x FLC})] \text{ x } I_F$ (see Exh. VZ-38, at 60; see also Exh. DTE-VZ 1-2). When calculating the expense-to investment ratio ("E/I ratio"), there should be a consistency between the numerator and denominator in terms of the time period and network assumption. The FCC uses the current time period and current network for both the numerator and the denominator. On the other hand, Verizon uses the future time period and forward-looking network. As the FCC makes booked investment current by applying the current-to-book ratio, Verizon's methodology to make the current network forward-looking by applying the FLC is logical, i.e., Verizon's FLC performs the same function that the FCC's current-to-book ratio does.

As shown in Option C and Option D in Appendix A, as long as there is a consistency of time period and network assumption between the numerator and the denominator in the E/I ratio, both Current E/I ratio and Forward-Looking E/I ratio will result in the same amount of forward-looking expenses. We agree with Verizon that as forward-looking expenses are used in the numerator, it is only logical to adjust the denominator (the current investments) by the FLC to make it forward-looking. Contrary to the CLECs' claim that the numerator does not reflect the efficiency gain from a change in technology mix, Verizon shows that the numerator in fact does reflect the forward-looking technology mix proposed by it (see Tr. 10, at 1919-1921; see also RR-DTE-93).

With respect to the CLEC Coalition's claim that account-specific FLCs should be calculated to reflect differing forward-looking to current investment ratios, the CLEC Coalition was provided with all of the data (i.e., 1999 and forward-looking investment data) needed to calculate plant-specific FLCs but, nevertheless, failed to show whether FLCs computed based on aggregated investments introduce any systematic bias. In addition, it is impractical to use account-specific FLCs for numerous plant accounts.

Regarding the CLEC Coalition's claim that CB ratios generally are used to demonstrate that replacement investment is greater than book investment, we disagree with the CLEC Coalition's characterization of replacement investment. What the CLEC Coalition refers to as replacement investment is in fact reproduction cost,[49] i.e., how much it would cost to build the existing network today or the existing network valued at current prices. Replacement investment, on the other hand, is how much it would cost to replace the existing network today with equipment that harnesses new technologies, i.e., a forward-looking network valued at current prices. A comparison between booked and reproduction investment is qualitatively different from a comparison between current and replacement investments. The former is to value the existing network at different prices (booked prices versus current prices) while the latter is to value different networks (current network versus forward-looking network) at the same price (current prices). See Inputs Order at ¶¶ 368, 369-376, 369 n.1178; see also Option

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49 The FCC distinguishes "reproduction" and "replacement" costs. See Inputs Order at ¶¶ 368-369.

A in Appendix A to this Order. The FCC also states that the forward-looking economic costs of UNEs may be higher or lower than historical embedded costs. See Local Competition Order at ¶ 705 (emphasis added).

With respect to the CLEC Coalition's argument that Verizon's proposed E/I ratio is a departure from Verizon's own historical trend of the E/I ratio, we note that the historical trend is based on incremental changes to Verizon's actual network, and a new forward-looking network is radically different from Verizon's existing network. Therefore, the historical relationship between the expenses and investments may be neither directly applicable nor analogous to the relationship between forward-looking expenses and investments. Furthermore, the CLEC Coalition's Chart 4 (see Exh. CC-13, at 21, Chart 4) does not correctly characterize Verizon's proposed E/I ratio. In comparing the FLC-adjusted ratio to the historical trend of the ratio, the CLEC Coalition fails to adjust the numerator of the FLC-adjusted ratio. Thus, the CLEC Coalition's FLC-adjusted ratio is a ratio of current expenses to forward-looking investment.

In addition, we reject the CLEC Coalition's argument that since Verizon did not propose to use the FLC in the Consolidated Arbitrations, we should not allow Verizon to use the FLC in this proceeding. However, in the Phase 4 Order, we used a ratio of NYNEX's expense level to the average of the entire group of ten Bell operating companies ("BOCs") as a surrogate in order to determine the level of forward-looking joint and common cost. Phase 4 Order at 60. The methodology used to calculate forward-looking expenses in this proceeding is different from what was used in the Phase 4 Order. For all of the reasons described above, we conclude that Verizon's ACFs should be adjusted by the proposed FLC factor.

Finally, we note that our directives to Verizon to revise its network assumptions or input values in other sections of this Order (e.g., proportion of copper/IDLC/UDLC) may lead to a forward-looking investment different from what Verizon proposed and, thus, a FLC factor different from Verizon's proposed 80 percent FLC factor. Therefore, we direct Verizon in its compliance filing to file a new FLC with supporting documentation that shows in detail how the level of investment in each plant account has changed and how it calculated a new FLC. In addition, we direct Verizon to re-file the Network, Wholesale Marketing, Other Support, and Common Overhead ACFs reflecting a new FLC factor, with supporting documentation. This documentation is necessary in order for the Department to assess Verizon's compliance with our directives.

3. Productivity and Merger Savings

a. Positions of the Parties

i. Verizon

(A) Productivity

Verizon adjusts the ACFs, which it developed using expenses for calendar year 1999, for inflation and productivity in its VCost system for a three-year planning period beginning 2001 (Exh. VZ-36, at 55). Based on its estimates of labor inflation (a labor cost index), general inflation (the Consumer Price Index), and productivity, Verizon develops levelized ACFs, which, as discussed in Section V.C, above, are applied to the TELRIC investments (id.). Verizon uses a cumulative inflation factor of 7.99 percent, which would be offset by a cumulative productivity factor of 5.76 percent in its calculation of expenses, and thus, according to Verizon, inflation will outpace productivity during the three-year period beginning 2001 (Exh. VZ-36-A; Exh. CC-11). According to Verizon, its productivity factor includes anticipated productivity gains from the Bell Atlantic/GTE merger and from restructuring (Exh. VZ-38, at 11). Verizon explains further that the composite productivity adjustment used to bring 1999 expenses to 2003 is 10.7 percent (Exh. VZ-38, at 12; Exh. CC-VZ 1-6; Exh. CC-VZ 1-16; Tr. 9, at 1724-1725).

Verizon counters the intervenors' concern that Verizon's productivity adjustment outpaces inflation by asserting that this "simply reflects the level of inflation growth in the telecommunications industry and in particular in Verizon MA's region" (Verizon Brief at 105 n.84, citing Tr. 9, at 1721). Verizon explains that the reason the productivity assumption of 3.3 percent proposed by Verizon in New York differs from the 2.86 percent proposed in Massachusetts is that Verizon attempted "to be consistent with the productivity approach adopted previously by the New York Commission" (Verizon Reply Brief at 42-43). Verizon also explains that it did not include an inflation adjustment in New York because the New York Public Service Commission ("NYPSC") had rejected such an adjustment in an earlier proceeding, but that in Massachusetts "Verizon MA has properly accounted for inflation" (id. at 43).

In response to Mr. Fisher's assertion that a 3.95 percent annual productivity adjustment is appropriate, and, furthermore, is based on Verizon's own data, Verizon states that it does not believe the factor is reasonable (Exh. VZ-38, at 12-13). Verizon explains that the annual adjustment factor of 3.95 percent for productivity was directed by the NYPSC ALJ who stated "the average productivity factor selected by regulators in price cap proceedings implies an annual productivity factor of about 3.95%" (Exh. VZ-38, at 14, citing New York UNE Rates

Recommended Decision,[50] at 40. Verizon also asserts that the NYPSC rejected the annual productivity factor that the CLEC Coalition proposed (Verizon Reply Brief at 44, citing New York UNE Rates Order,[51] at 56).

(B) Merger Savings

Verizon contends that intervenors' arguments for including a specific merger-savings adjustment fail to recognize that Verizon must spend money on restructuring and pension enhancements in order to achieve the merger savings (Verizon Brief at 105). Furthermore, Verizon states that information regarding the savings resulting from the merger between Bell Atlantic and NYNEX is "past history" because that merger occurred in 1997 and Verizon's calculation of productivity-related adjustments begins in 1999 (Tr. 9, at 1716). Furthermore, contending that it is unnecessary, Verizon stated that it does not provided any "mapping" from the S-4 form document filed with the Securities and Exchange Commission to the productivity adjustments in its cost study (id. at 1719). Verizon states that the productivity offset it proposes in this proceeding "is based on our company's business-planning economists' estimate of overall productivity, including, not necessarily limited to, merger related savings" (id.). According to Verizon, its cost study "includes a productivity adjustment that captures the efficiencies that could be realized in a forward-looking environment as a result of ongoing

50 Proceeding on Motion of the Commission to Examine New York Telephone Company's Rates for Unbundled Network Elements, NYPSC Case 98-C-1357, Recommended Decision on Module 3 Issues (May 16, 2001) ("New York UNE Rates Recommended Decision").

51 Proceeding on Motion of the Commission to Examine New York Telephone Company's Rates for Unbundled Network Elements, NYPSC Case 98-C-1357, Order on Unbundled Network Element Rates (January 28, 2002) ("New York UNE Rates Order").

efforts to increase company productivity, including the efficiencies realized by mergers" (Verizon Reply Brief at 42).

Verizon responds to the arguments of AT&T, the CLEC Coalition, and WorldCom by stating that they "ignore the testimony of Verizon MA explaining that potential savings attributable to the merger have already been captured in Verizon MA's forward-looking productivity adjustments" (id. at 44). Verizon argues further that the "efficiencies realized through mergers are no different from other efficiencies that Verizon MA anticipates, and thus there is no reason to attempt to 'separately segregate' merger-related efficiencies from other efficiencies" (id.). Verizon opposes an analysis of merger savings that excludes the costs associated with the implementation of a merger (id. at 45). Regarding merger savings attributable to the Bell Atlantic/NYNEX merger, Verizon claims that these are reflected in base-year expenses, used to calculate ACFs, and that also, the productivity adjustment captures anticipated merger synergies (id. and n.44).

Similarly, Verizon contends that the proposal of AT&T's witness Baranowski to reduce Verizon's common costs by 2.5 percent because of merger savings fails to: (1) offset the reductions by merger-related costs; and (2) recognize that Verizon's productivity adjustment already includes anticipated merger-related savings (id. at 45). Verizon also contends that the "arguments in support of substantial adjustments are entirely speculative" and that "[a]nticipated merger savings are not always realized given the uncertainty of the surrounding regulatory and economic environment" (id.). Verizon also criticizes the CLECs' methodology for computing the additional savings because they base their analysis on "company-wide data that is not necessarily related to the costs of provisioning UNEs in Massachusetts" (id. at 46).

Verizon characterizes AT&T's calculation "based upon a comparison of combined GTE/Bell Atlantic revenues to potential savings" as "meaningless" and irrelevant to determining UNE costs in Massachusetts (id.).

ii. AT&T

(A) Productivity

AT&T faults Verizon for the lack of "explanation, justification, or even quantification of its productivity assumptions" (AT&T Brief at 34). According to AT&T, Verizon implied that the productivity adjustment proposed for this proceeding is similar to the one used in New York (id., citing Exh. VZ-38-A, at 12). AT&T opposes Verizon's proposal to offset its productivity adjustment by inflation and indicates that in New York, Verizon did not propose such an offset (id. at 35). Furthermore, according to AT&T, "in New York, Verizon conceded that a TELRIC study should assume productivity gains 'above inflation' of at least 3.33 percent per year," and thus that same level should be applied in Massachusetts (id. at 36).

AT&T also contends that the productivity gain should be applied over the entire five-year period, and, thus, the gains should be projected through 2004, the expected mid-point of the period during which rates that are established in this proceeding take place (id. at 36). Combining these three recommendations (an assumption of zero-cost inflation as Verizon proposed in New York, using a productivity adjustment of 3.33 percent as Verizon uses in New York, and projecting productivity gains through the mid-point of the planning period), AT&T recommends that the Department require zero cost inflation and use a composite productivity adjustment of negative 15.6 percent (id.).

(B) Merger Savings

AT&T contends that, because Verizon's proposed annual growth in productivity is based on productivity growth trends and predictions that predate the Bell Atlantic/GTE merger, contrary to Verizon's assertion, they could not incorporate the impact of the merger (id. at 37). Also, AT&T contends that a forward-looking TELRIC study should not reflect one-time transition costs of the merger but rather should only account for the merger savings (id. at 38). Specifically, AT&T proposes a reduction of 3.57 percent in the common overhead factor, which it derives by dividing the merger-related savings of $2 billion by the combined GTE/Bell Atlantic revenues of $56 billion (id.). AT&T asserts further that this figure may be too low (id.).

iii. WorldCom

(A) Productivity

WorldCom questions why Verizon cannot realize the same productivity gains in Massachusetts as it has assumed in New York (WorldCom Brief at 70). WorldCom recommends that a 3.3 percent per year net-of-inflation productivity gain, i.e., the level assumed in New York, apply in Massachusetts (id.).

(B) Merger Savings

WorldCom supports a reduction of 3.57 percent in Verizon's joint and common cost factor based on Verizon's public statements about the beneficial effects of the merger (id. at 69). WorldCom also contends that Verizon has failed to support its assertion that it has already incorporated the merger-related synergies into its productivity offset other than with a "vague reference to a discussion with internal Verizon economists" (id.).

iv. CLEC Coalition

The CLEC Coalition recommends that the Department adopt a 3.95 percent annual productivity factor because, according to the CLEC Coalition, Verizon's proposed productivity factor is inappropriately "diluted" by restructuring costs (CLEC Coalition Brief at 30). Alternatively, the CLEC Coalition recommends that the Department reduce its proposed factor by ten percent to account for the relationship of the annualized merger transition costs to the annualized revenue, expense, and capital synergies (id. at 31). The CLEC Coalition also asks the Department to give weight to the decisions of the Rhode Island Public Utility Commission and the New Hampshire Public Utility Commission to reduce UNE rates by 7.11 percent and by 6.43 percent, respectively, to reflect savings from mergers and process re-engineering activities (id. at 31-32). Finally, the CLEC Coalition contends that Verizon voluntarily proposed to absorb inflation in New York, but has failed to do so here, which the CLEC Coalition asserts further validates its proposed factor of 3.95 percent (id. at 32).

v. DOD/FEA

The DOD/FEA asserts that Verizon's UNE costs are inflated because they fail to incorporate adequately the savings associated with the GTE merger (DOD/FEA Brief at 10). The DOD/FEA recommends that the Department require Verizon to provide a well-documented, Massachusetts-specific estimate of savings for the Department and other parties to review, and that regardless, the Department make some adjustment for the merger (id. at 11).

b. Analysis and Findings

Verizon proposes a productivity offset, which it contends takes into account merger synergies. Intervenors raise two issues that merit consideration: (1) the reasonableness of

Verizon's inflation-adjusted productivity offset; and (2) the need, if any, for a separate, explicit adjustment for the impact of merger synergies on Verizon's expenses. As we explain in more detail below, we are persuaded by Verizon's argument that merger synergies are one way in which Verizon achieves its productivity, and thus we focus our analysis on whether Verizon adequately incorporates the beneficial impact of mergers in its estimated productivity. The VCost system uses inflation and productivity inputs that Verizon specifies (Exh. VZ-CC 1-16). Among other things, Exh. VZ-CC 1-16 includes Verizon's estimates for the Consumer Price Index ("CPI") for the years 1995 through 2003 and its estimates for productivity for each of the years 1996 through 2003 (Exh. VZ-CC 1-16; Exh. VZ-CC 1-16-S). These data have been afforded proprietary treatment but Verizon's proposed productivity factors of 2.73 percent and 3.12 percent for the years 2002 and 2003, respectively, appear in Exh. CC-11, which is not proprietary. Exh. CC-11, a non-proprietary document, consists of an excerpt from Verizon's VCost Report and shows a cumulative productivity value offset of 5.76 percent over three years and a cumulative inflation factor of 7.99 percent over three years. The cumulative productivity offset of 5.76 percent is computed using an assumption that 2001 is the base year for the TELRIC study, and thus does not include Verizon's estimate of its productivity in 2001 (Exh. CC-11).[52]

Contrary to AT&T's argument, another jurisdiction's decision not to offset Verizon's productivity factor by inflation does not, per se, bear on this Department's findings. AT&T failed to explain the rationale for ignoring inflation in developing expense factors. We find

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[52] Verizon's proposed cumulative productivity offset of 5.76 percent is calculated as follows:

$$1 - [(1\text{-}0.0273)\ (1\text{-}0.0312)]$$

Verizon's proposal to offset productivity by inflation reasonable because both productivity and inflation affect Verizon's costs (RR-DTE-52-P). Verizon provided updated information on inflation in response to a record request. Verizon shall use these more recent inflation data in its compliance filing.

We concur with AT&T that the productivity gain should be applied over the entire five-year period that TELRIC rates are anticipated to be in effect, because Verizon's proposed methodology does not account for productivity gains that Verizon will realize in the last two years in which TELRIC rates are in effect, and thus the UNE rates would overstate Verizon's forward-looking costs. Therefore, Verizon shall project the gains (and inflation) through 2004, i.e., the expected mid-point of the period during which rates established in this proceeding are to be in effect.

As Verizon indicates, the NYPSC, contrary to the recommended decision of the ALJ, rejected the CLEC Coalition's proposed annual productivity adjustment factor of 3.95 percent, and stated that it would instead "reflect in the rates set here a placeholder estimate of savings associated with the Bell Atlantic/GTE merger, and recognition of those specific savings warrants tempering the Judge's general productivity adjustment, which is, again, simply a surrogate for specific savings that cannot be quantified." The NYPSC approved the productivity rates proposed by Verizon. New York UNE Rates Order at 55-56. However, in reaching this conclusion, the NYPSC expressed concern about possible double counting or overstatement of potential savings in the productivity and merger-related adjustments, and stated that it "agree[d] with the Judge that savings associated with the Bell Atlantic/GTE merger should be reflected here, and there is no basis for finding that they are already subsumed in Verizon's productivity adjustment." New York UNE Rates Order at 76. Thus, one of the reasons that the NYPSC rejected the CLEC Coalition's proposed productivity adjustment was that the agency determined a need to account for merger savings explicitly rather than implicitly through the productivity factor. In New York, Verizon's UNE rates will be adjusted prospectively at the conclusion of the PSC's investigation of merger savings, which is occurring in a separate NYPSC proceeding.[53] New York UNE Rates Order at 76.

By contrast, because we have determined that it is inappropriate to disaggregate merger-related savings from the general productivity factor, our review of the productivity factor incorporates our assessment of the general impact of Verizon's recent mergers on its costs, and we exercise our judgment to revise Verizon's productivity factor accordingly, as discussed below. Although the 1997 merger between Bell Atlantic and NYNEX is, as Verizon observes, in the past, the merger synergies are continuing to occur, and yet the integration costs of that earlier merger have ceased. Furthermore, the merger synergies associated with the Bell Atlantic/GTE merger are substantial. Having completed two major mergers within recent years, Verizon does not persuade us that inflation will outpace its productivity in the upcoming years. Verizon has provided minimal information and explanation of its projected productivity factors, which makes it difficult for the Department to determine the likely level of productivity that Verizon experiences presently or is likely to experience during the next five years while the UNE rates that this proceeding establishes are in effect. The adjustment we direct below addresses this concern.

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53 Proceeding on Motion of the Commission to Consider Cost Recovery and Modification of Performance Regulatory Plan Under Merger Standards and to Investigate the Future Regulatory Framework, NYPSC Case 00-C-1945.

Intervenors have reasonably questioned the link between the level of productivity that Verizon's economists project and the merger synergies. Verizon's arguments on this point are not persuasive, nor did Verizon sponsor a witness who could explain the underlying assumptions about productivity and merger synergies. It is in this context that we examine the evidence and arguments on this issue.

As AT&T indicates, Verizon's economist prepared his productivity projections in January 2000, before the Bell Atlantic/GTE merger occurred (Exhs. CC-VZ 1-16, CC-VZ 1-16-S; Tr. 9, at 1866-1867). However, contrary to AT&T's implication, although the merger had not yet occurred, the merger applicants had completed a detailed proxy statement, which includes estimates of merger synergies, in April 1999 (RR-DTE-8). Verizon states that, "[i]n our discussions with our economists who provide this data to us, they've indicated to us that this level of productivity indicated in this data includes all of the projected productivity, to include any merger-related and restructuring savings" (Tr. 9, at 1867). Thus, Verizon's economists could have accounted for the substantial merger gains in their development of a productivity estimate. However, Verizon failed to demonstrate <u>how</u> its economists incorporated that information.

Furthermore, Verizon's argument regarding the uncertainty about its ability to achieve merger savings undermines its assertion that its economists have adequately considered merger savings in the development of the proposed productivity offset. Based on the record, the Department cannot determine by how much, if at all, the economists have discounted the merger savings because they are "speculative" (<u>see</u> Verizon Reply Brief at 45).

During the period that the UNE rates that are set in this proceeding are in effect, Verizon will benefit from substantial merger synergies associated with reductions in operating expenses, reduced capital procurement expenses, and enhanced revenues (RR-DTE-8; RR-DTE-85). Verizon is concerned that the merger savings are uncertain (Exh. VZ-38-A, at 12-13). The evidence shows that although the synergies are necessarily "forecast," there is a high probability that Verizon will achieve them. A declaration filed with the FCC on behalf of Bell Atlantic and GTE indicated that the anticipated cost savings and revenue improvements resulting from the merger of Bell Atlantic and GTE were "hard, real, and certain" (RR-DTE-84). The declaration also asserted that the Bell Atlantic-NYNEX merger "reconfirmed that these merger efficiencies are real" (id.). The record indicates that Verizon's predecessor companies expressed confidence in their ability to achieve merger savings (id.). The predecessors' statements amount to earlier admissions against Verizon's current interest. As such, these statements tend to impeach current claims that discount merger savings and tend to prove that the merger savings are, in fact, "hard, real and certain."

Furthermore, Verizon has not provided any evidence to suggest that it is not on track to achieve the substantial merger synergies that it described to its stockholders and to the FCC. Indeed, the evidence suggests that Verizon is achieving the forecast synergies (RR-DTE-84, RR-DTE-85). Verizon also indicates that its 1999 base year expenses incorporate merger savings specifically associated with the Bell Atlantic/NYNEX merger, which occurred in 1997 (Verizon Reply Brief at 45 n.44). Contrary to Verizon's implication, however, the base year is not sufficiently representative of the impact of the Bell Atlantic/NYNEX merger on Verizon's costs in future years. Bell Atlantic and NYNEX anticipated a ramp-up period for synergies, which was not yet complete in 1999. Specifically, Bell Atlantic, in a declaration submitted to the FCC in 1998,[54] stated: "For 1998, we projected an increased expense savings of $450 million, and we are achieving those savings. By 2000, we projected annual expense savings of $1.1 billion; we are on track to achieve those savings" (RR-DTE-84).

Also, unlike merger synergies, which recur annually, integration costs are transitional. In the S-4 document filed with the SEC in 1999, Bell Atlantic and GTE stated that the "integration of Bell Atlantic and NYNEX is now largely complete, and the forecast efficiencies are being achieved successfully" (RR-DTE-8, Joint Proxy Statement of Bell Atlantic and GTE, 1999, at 34). Thus, from the perspective of the Bell Atlantic/NYNEX merger, the use of the 1999 "base year" to estimate expenses overstates merger-related costs and understates merger-related savings for the relevant five-year period that the TELRIC costs will be in effect: it includes integration costs that are no longer relevant and includes a level of savings in a year before Verizon fully realized the merger synergies. Therefore, by using 1999 as the base year, Verizon has failed to account fully for the impact of the Bell Atlantic/NYNEX merger on its forward-looking costs.

We now turn to Verizon's incorporation of the Bell Atlantic/GTE merger savings in its development of a productivity factor. In a response dated February 6, 2002, Verizon indicated that that it had achieved an estimated $1.1 billion in annualized merger savings in 2001 and continues to have a goal of achieving expense savings of $2 billion by the end of 2003 (RR-DTE-85). Verizon also anticipates incurring a total of $2 billion in merger integration costs by

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[54] RR-DTE-84 (In the Matter of GTE Corporation, Transferor and Bell Atlantic Corporation, Transferee for Consent to Transfer Control, CC Docket No. 98-184, Declaration of Doreen Toben on behalf of Bell Atlantic, September 30, 1998).

2003 (id.). The projected 2003 merger savings that Verizon reports in this proceeding are consistent with those it forecast almost three years ago, thus increasing the likelihood that the actual merger synergies in 2003 and for each subsequent year will be the same as was originally anticipated. In the Bell Atlantic/GTE Proxy Statement, filed with the Securities and Exchange Commission in April 1999, the merger applicants indicated that they anticipated that by the third year after completion of the merger (which would be June 2003), the merger would lead to annual revenue synergies of $2 billion (yielding $500 million in annual incremental operating income); annual expense synergies of $2 billion; and annual capital synergies of $500 million (RR-DTE-8, at 33).

The $2 billion in annual expense synergies is associated with “savings generated from operating and procurement synergies, reduced corporate overheads, the migration of long distance traffic onto GTE’s network, and greater efficiency in wireless operations” (id.). The integration costs are one-time costs and the expense savings are ongoing savings (id. at 34, 75).

The Bell Atlantic/GTE merger occurred mid-year 2000 and thus the integration costs will have largely ended by the mid-year 2003, and yet the UNE costs set in this proceeding will likely stay in effect until 2007, or longer (see Section XII). Nonetheless, achieving recurring merger synergies requires one-time merger integration costs. If we annualize the anticipated total $2 billion in integration costs over five years, the annual savings of $2 billion would be, net of integration costs, $1.6 billion. Verizon proposes that the Department accept Verizon’s representation that its economists have adequately accounted for merger savings in their estimated productivity offset, but it has not demonstrated the way in which this process and calculation have occurred. Based on our review of the record evidence discussed above related to merger costs and savings, we direct Verizon to use a productivity offset of 4.5 percent for each of the years, 2002 through 2004, and to re-run VCost with this adjustment. This adjustment recognizes that Verizon's economists considered merger synergies, but not to a sufficient degree, and furthermore is in lieu of a separate merger-related adjustment to Verizon's calculation of an annual cost factor.[55] In its compliance filing, Verizon must provide printouts from VCost that demonstrate the compliance with this directive. Earlier we directed Verizon to: (1) account for the productivity gain over the entire five-year period that TELRIC rates are anticipated to be in effect, and specifically to compute productivity gains through 2004 (i.e., the expected mid-point of this period); and (2) use 2002 as the initial year. Therefore, the cumulative productivity will be 12.90 percent.[56] Verizon raises a reasonable point that a more detailed analysis of merger savings would go beyond a simple comparison of projected company-wide savings, which include non-regulated activities, with combined GTE/Bell Atlantic revenues. We address that concern within the context of the evidence in this proceeding and the context of Verizon's decision to provide minimal supporting documentation for its proposed productivity offset, which, Verizon claims, accounts for the anticipated effect of merger synergies. The revised productivity factor that we direct is

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55 We address productivity in this TELRIC proceeding because one of the components of Verizon's TELRIC study is its estimate of its future productivity. In our determination that Verizon must use an annual productivity factor of 4.5 percent, we are exercising our judgment and agency expertise applied to the record evidence on merger costs and savings.

56 The cumulative productivity of 12.90 percent is calculated as follows:

$$1- [(1-0.045)\ (1-0.045)\ (1-0.045)].$$

intended to address the following: (1) the effect of the likely overstatement of expenses in the 1999 base year resulting from the fact that the 1999 Bell Atlantic/NYNEX integration expenses in that year are not representative of the forward-looking period; (2) the Bell Atlantic/NYNEX expense savings were not anticipated to be fully ramped up until the year 2000, a year after the base year; and (3) the beneficial impact of the Bell Atlantic/GTE merger on Verizon's productivity.

4. Retail-Related Expenses

a. Introduction

The FCC rules provide that costs associated with billing, marketing, collection and other costs attributable to the provision of retail service may not be considered in calculating wholesale UNE rates. See 47 C.F.R. § 51.505(d)(2). To comply with this requirement, adjustments must be made to exclude retail-related expenses from the UNE cost studies. To this end, Verizon's UNE cost studies incorporate Verizon's avoided-cost study which had been filed in Part B of this proceeding, but was dismissed by the Department in connection with the decision by the United States Court of Appeals for the Eighth Circuit in Iowa Utils. Bd. v. FCC, 219 F.3d 744. See Interlocutory Order on Part B Motions at 14-15.

More precisely, the FCC resale discount rules required that the discount be based on "avoidable" costs, rather than costs that are actually avoided by the ILEC. The Eighth Circuit, however, held that "the plain meaning of [47 U.S.C. § 252(d)(3)] is that costs that are actually avoided, not those that could be avoided or might be avoided, should be excluded from the wholesale rates," and thus vacated and remanded the FCC's "avoidable" cost discount rules. Iowa Utils. Bd. v. FCC, 219 F.3d at 755. Accordingly, the Department concluded that, due to uncertainty as to the FCC's forthcoming rules on remand, it would hold Part B of this docket in abeyance until the FCC promulgated new rules for state commissions to follow. Interlocutory Order on Part B Motions at 13-15. In the case at hand, AT&T challenges the use of Verizon's avoided-cost study as an input to its TELRIC study.

b. Positions of the Parties

i. Verizon

Verizon maintains that it has properly excluded retail-related costs from its UNE cost assumptions based upon the avoided-cost analysis presented by Verizon in Part B of this proceeding, and argues that it would be unreasonable to apply, as AT&T recommends, the avoidable cost standard that the Eighth Circuit has since deemed unlawful (Verizon Reply Brief at 49). Verizon asserts that the more reasonable approach is for the Department to adopt Verizon's ACFs and to adjust the factors, if necessary, after consideration of the retail cost arguments in Part B of this proceeding and based upon the standard that will result from the Eighth Circuit's remand to the FCC (id. at 50).

ii. AT&T

AT&T contends that Verizon has understated the amount of its historic expenses that must be excluded as purely retail-related and, consequently, overstated its ACFs and therefore its UNE cost estimates (AT&T Brief at 44). With regard to Verizon's suggestion that the Department defer retail cost issues until Part B of this proceeding is completed, AT&T rejects this suggestion for two reasons. First, noting that the Act defined two different pricing standards, one for purchasing UNEs and another for resold services, AT&T asserts that the Eighth Circuit's decision regarding the pricing standard for resold services has nothing to do with the pricing of UNEs (id. at 46). As further support, AT&T also points to the NYPSC's Order on this issue (id.). Accordingly, by applying the now-dismissed avoided-cost study, AT&T maintains that Verizon has applied the wrong standard to its adjustment for retail-related expenses and has therefore inappropriately included retail-related expenses in its ACFs (id. at 47). Secondly, even if the Eighth Circuit decision applied to the setting of UNE rates, argues AT&T, because the Department has ruled that pending further FCC action it will maintain the current resale discount, and thus the underlying calculation of the percent of total costs to be excluded as retail-related, the same status quo should be maintained as the default for purposes of setting UNE rates (id. at 45).

Lastly, AT&T maintains that Verizon includes substantially more retail-related expenses in its ACFs than the Department permitted in the Consolidated Arbitrations and that Verizon has not presented any good reason for deviating from the Department's previous findings regarding the extent to which Verizon's expenses are retail-related (id. at 44). AT&T recommends that Verizon's ACFs be revised to exclude at least the share of expenses found to be retail-related in the Consolidated Arbitrations, and provides the results of its calculations for these exclusions as an addendum to its brief (id. at 47-48).

c. Analysis and Findings

As AT&T correctly notes, the Act explicitly outlines two different pricing standards, one for resold services and another for TELRIC-based UNE rates, and, although the Eighth Circuit has determined that the application of an avoidable cost standard to resold services is inconsistent with the Act, the Eighth Circuit, contrary to what Verizon asserts, made no finding on the application of an avoidable cost standard for TELRIC-based UNE rates. Thus, a retail-related expense adjustment based upon avoidable costs is neither inconsistent with the Act, nor with the Eighth Circuit's decision.

Moreover, we conclude that a retail-related expense adjustment based upon avoidable costs is not only permissible, but is also the appropriate standard for setting TELRIC-based UNE rates. In the Vote and Order, the Department determined that, "pending a FCC ruling on remand of its pricing rules or a higher court ruling overturning the Eighth Circuit's findings," the Department would "maintain the status quo for UNE prices," which we noted was the use of the FCC's TELRIC and avoidable cost methods. Vote and Order at 5. The Department further stated that, despite regulatory uncertainty, the FCC's TELRIC and avoidable cost wholesale discount were the only viable methods to rely upon. Id. This conclusion continues to hold true.

Because the Department has ruled that pending further FCC action it will maintain the current resale discount, and thus the underlying calculation of the percent of total costs to be excluded as retail-related as determined in Phase II of the Consolidated Arbitrations, we agree with the position set forth by AT&T that the same status quo should be maintained as the default for purposes of setting UNE rates.[57] Accordingly, with the exception of wholesale advertising expenses,[58] the Department directs Verizon to revise its ACFs to exclude all retail-related expenses to the extent required by the Consolidated Arbitrations.

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[57] We note that this finding is consistent with the NYPSC's decision on this issue.

[58] See Section V.C.8, regarding the Wholesale Marketing ACF.

5. Network ACFs [59]

a. Positions of the Parties

i. Verizon

In calculating its Network ACF, Verizon assumes a five percent reduction in "R" dollars (the costs associated with maintenance and repair for copper cables) on the premise that the costs would decrease with placement of newer copper plant. Verizon does not reduce "M" dollars, the expenses attributable to rearrangements due to customer moves, municipal requirements, and network upgrades, because, as Verizon states, the activities associated with "M" dollars are done on a required basis, independent of technology or age of plant, and, thus, the costs associated with those activities would not decline in a forward-looking network (Exh. VZ-36, at 42-44).

Verizon argues that a five percent reduction in repair costs for copper cables is reasonable, because it approximates expenses over the long run in compliance with TELRIC and is based on inputs from experienced subject matter experts ("SMEs"). Verizon claims that AT&T's 30 percent reduction proposal is based on the unrealistic assumptions that: (1) the existing plant consists entirely of old, outdated cable that requires high maintenance; and (2) the lower levels of maintenance associated with newer cables will continue indefinitely. Verizon asserts that these assumptions are flawed because: (1) a large percentage of existing plant has been placed in service within the last ten years and does not require significantly more maintenance than newer cables placed today; and (2) it is "pure fantasy" that even a new

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[59] According to Verizon, Network ACFs represent the ratio of network-associated expense (e.g., maintenance, repair, rearrangement, testing, administration and staff support) to investment. See Exh. VZ-37, Part G-5 (Network Factors), at 1.

cable will forever be trouble-free and will never need repair once laid in the ground. According to Verizon, because cable maintenance expenses will be incurred regularly and cable will be replaced in the long run, the most accurate measurement of cable maintenance expenses for a company operating in the long run is the average level of expenses that the company currently incurs (Verizon Brief at 106-107, citing Exh. VZ-38-A, at 15). With respect to the CLECs' claim that there should be no upgrades in a forward-looking network, Verizon asserts that even if it has in place an optimally designed network, it will still be required to reconfigure its facilities to reflect new municipal ordinances and movement of customers (Exh. VZ-36, at 42-44).

ii. AT&T/WorldCom

AT&T contends that Verizon can expect to incur substantially lower repair and maintenance expenses than it currently incurs in connection with its embedded, inefficient network. AT&T contends that when the new forward-looking plant specifically designed to meet current demand is installed, both "M" and "R" dollars will decline from their historic levels. AT&T argues that Verizon understates the reductions for repair and maintenance expenses and provides no explanation for the five percent "R" adjustment for copper facilities. AT&T claims that the five percent adjustment falls far short of the actual adjustment required to capture the maintenance and repair benefits of all new copper facilities. AT&T asserts that the 30 percent reduction it recommends more properly captures the cost savings in a forward-looking network (AT&T Brief at 42-43, citing Exh. ATT-23, at 43). WorldCom supports AT&T's position (WorldCom Brief at 69-70, citing Exh. ATT-23, at 43).

b. Analysis and Findings[60]

First, we note that neither Verizon nor the CLECs provided any data or sufficient evidence to support their proposed reduction of network expenses. We can at least infer from Verizon's argument that there are some copper facilities more than ten years old, and that these would require more maintenance than newer copper placed today. Since under TELRIC principles, we envision brand new facilities, a reduction of "R" dollars would be higher than Verizon proposes in its study, which assumes replacing only old facilities with new ones.

On the other hand, although the starting level of expenses for new plant may be lower than the historical level of expenses, "R" dollars will increase as the facility becomes older. A new facility does not stay new forever, and, thus, the activities associated with "R" dollars will increase as the facility ages. Therefore, we find that "R" dollars should be reduced, although not as much as the CLECs proposed.

With respect to "M" dollars, we do not agree with AT&T that new plant should be sized to meet the current demand. As we stated the Phase 4 Order, a network that is "dropped in place" will presumably exist beyond the moment it is dropped in place, thus it is reasonable to assume that plant should be sized to accommodate future changes anticipated at the time it is built. See Phase 4 Order at 32. As carriers are operating in a world for which they have imperfect knowledge, a degree of uncertainty should be taken into account when building a new network, because the anticipated changes may or may not materialize. Thus, even a carrier with new facilities must anticipate performing activities associated with "M" dollars (Exh. VZ-36, at 42-44). Accordingly, we find that "M" dollars should be reduced less than

60 See also Section X.C, for further discussion of Repair and Maintenance Expenses.

the percentage that the CLECs proposed, which assumes a perfectly-sized new network that would require no adjustments and has substantially lower maintenance expenses over the life of the network.

We note that the amount of reduction for "M" would be less than "R," because Verizon adequately explained why the activities associated with "M" dollars are independent of technology and, thus, would not substantially change in a forward-looking network. However, although Verizon asserts that the volume of activities associated with "M" dollar would not decrease because the activities are independent of network assumptions, Verizon fails to demonstrate whether the cost per activity will remain the same. It is reasonable to assume that Verizon's personnel will be able to perform the activities associated with "M" dollars more efficiently in the future, because Verizon has gained experience in performing the associated activities and thus should benefit from a learning curve to increase efficiency. Verizon proposes a five percent reduction in "R" dollars, and no reduction in "M" dollars. Based on the foregoing analysis of record evidence, we direct Verizon to revise Verizon's proposed "M" and "R" dollars for copper cables to five percent and 15 percent, respectively. As in our ruling on the FLC, above, we note that our directives to revise Verizon's network assumptions (e.g., copper/IDLC/UDLC proportion) may lead to network expenses different from what Verizon proposes. We direct Verizon to submit, in its compliance filing, network expenses that reflect revised network inputs, with supporting documentation that shows in detail how those revisions have been incorporated and how the level of network expenses has changed for each plant account.

6. Common Overhead ACF[61]

a. Positions of the Parties

i. Verizon

According to Verizon, Common Overhead ACFs recover the expenses for the executive, planning, general accounting and finance, external relations and human resources, legal, and other general administration functions (Verizon Brief at 99, citing Exh. VZ-36, at 51). Verizon contends that the CLEC Coalition's argument that legal and regulatory costs should not be included in Other Support Expenses must be rejected, since TELRIC allows ILECs to recover a reasonable share of common costs, which include regulatory and legal costs that Verizon incurs as part of provisioning UNEs (id. at 109; Verizon Reply Brief at 51, citing Tr. 10, at 1951-1952).

Verizon states that the ACF_{COH} is adjusted by the FLC in a manner different than other expenses because the ACF_{COH} contains both costs that have already been adjusted with the FLC and costs that have not been adjusted with the FLC. Verizon explains that since the FLC is already applied to the identified costs in some studies, such as Network, Wholesale, and Other Support, it would be inappropriate to apply a FLC adjustment to ACFs for the portion of the identified costs that already reflect a FLC adjustment. Verizon states that in developing a weighted average FLC, Verizon already identified FLC-adjusted expenses (such as capital costs) and non-adjusted expenses (such as NRCs), and the relative percentage of the two is

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61 According to Verizon, the Common Overhead ACF ("ACF_{COH}") is developed by creating an expense relationship between common overhead expenses (e.g., Executive, Planning, Human Resources, Legal, External Relation, etc.) and total company expenses. See Exh. VZ-37, Part G-2.

used to come up with a weighted average FLC for the ACF_{COH}. If the cost study contains expenses already adjusted with a FLC factor, the ACF_{COH} with a weighted average adjustment is appropriate. Verizon further explains that if the study does not contain expenses that have already been adjusted with FLC, the unadjusted ACF_{COH} is used (Exh. VZ-36, at 61-62; Exh. DTE-VZ 1-4).

ii. CLEC Coalition

The CLEC Coalition argues that contrary to Verizon's claim, declining investment due to technological change results not only in the reduction of direct expenses but also the reduction of indirect expenses, such as common overhead. The CLEC Coalition claims that Common Overhead Expenses should decrease because: (1) there is less need to repair, maintain, and oversee an upgraded, more efficient network, which reduces human resources expenses; (2) less maintenance and repair requires less equipment; and (3) fewer maintenance trips will mean fewer accidents and, thus, lower accident-related legal expenses. The CLEC Coalition also contends that lobbying, legal, and regulatory costs should not be included in UNE rates because: (1) these expenses are generally spent for the benefit of Verizon's retail offerings and adverse to CLECs' interests; and (2) although CLECs incur their own similar costs, they cannot recover those costs from ILECs (CLEC Coalition Brief at 35-36).

iii. Z-Tel

Z-Tel argues that Verizon's application of the weighted average FLC to already FLC-adjusted expenses is tantamount to adjusting it twice (Z-Tel Reply Brief at 4, citing Exh. Z-TEL-1, at 9-12).

b. Analysis and Findings

In addressing joint and common costs, the FCC states that such costs remain unchanged as the relative proportion of products or services varies, and that a firm avoids such costs only by not providing each and every service or element in the subset. See Local Competition Order at ¶ 676. Most of the efficiency gains the CLEC Coalition cites are already captured in NRCs and Network ACFs, and, thus, are irrelevant to common overhead expenses. Unless the decrease in per-occurrence expenses claimed by the CLEC Coalition reaches such a level that warrants reducing the overall level of Verizon's human resources, Verizon will continue to incur the same amount of expenses for human resources. For example, Verizon would pay the same amount of salary to its employees whether it takes one hour or two hours to perform a certain activity. A change in the common overhead expenses is related to a change in the volume of services or products that Verizon provides rather than a change in per-occurrence expenses. Nothing in the record suggests that Verizon's efficiency gains warrant restructuring its human resources. If there were a reduction in the level of human resources, it would have been captured through the general productivity factor.

With respect to legal expenses, we agree with Verizon that such costs (e.g. costs associated with purchasing equipment, negotiating contracts, negotiating rights-of-way and labor negotiations, defending accidents, regulatory activities such as filing tariffs and appearing before state commissions) are expenses Verizon legitimately incurs in the course of provisioning UNEs to CLECs and, thus, Verizon should be allowed to recover them (Tr. 10, at 1950-1955). We disagree with the CLEC Coalition's analogy that because CLECs do not recover their legal expenses from Verizon, neither should Verizon be able to recover its legal expenses from CLECs. We find that analogy to be flawed. The CLECs have no reason to recover these costs from ILECs because ILECs are not CLECs' customers. We also disagree with the CLEC Coalition's claim that Verizon's legal expenses are spent against the CLECs' interests and, thus, should not be recovered from the CLECs. It is legitimate for private companies to have legal expenses reflected in the prices of their products to protect their own interest in dealing with their customers and other parties. For example, producers pass on to their consumers legal expenses from product liability suits, and Health Maintenance Organizations ("HMOs") may increase premiums based on the expectation that their legal expenses will increase as a result of new legislation allowing their customers (i.e., patients) to sue HMOs. A reasonable level of such expense is a cost of doing business.

With respect to Z-Tel's claim that Verizon applies the weighted average FLC to already FLC-adjusted expenses, Z-Tel appears to misunderstand Verizon's proposal. Z-Tel seems to mistake a weighted average ACF_{COH} for a weighted average FLC, which it believes is applied to already FLC-adjusted expenses. Verizon states that the expenses that are already adjusted are not adjusted again by the FLC, and the record confirms this statement (see Exh. DTE-VZ 1-4; see also Tr. 17, at 3504-3507).

7. Other Support ACF[62]

a. Positions of the Parties

i. Verizon

According to Verizon, Other Support ACFs recover expenses for information management, research and development ("R&D"), procurement, and the expenses and capital requirements associated with non-revenue producing investments in motor vehicles, land and buildings (excluding central office ("CO") buildings), general purposes computers, furniture, and official communications and support equipment. Verizon states that Other Support ACFs are incurred in support of all classes of plant and are attributed to all revenue-producing investment categories. Verizon also asserts that the costs associated with OSS are subtracted from the Other Support ACF (Verizon Brief at 99, citing Exh. VZ-36, at 49-51).

Verizon claims that the Other Support expenses are assigned based on the proportion of a UNE investment relative to the total forward-looking investments, and this methodology represents a fair way of attributing other support expenses to the various UNEs. With respect to CLEC Coalition's argument that there is a disproportionate assignment of other support expenses, Verizon claims that although allocation of Other Support expenses is based on the relationship of Other Support expenses to total plant investment, and a plant account with higher investment would incur a greater share of Other Support expenses, Other Support

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62 According to Verizon, Other Support ACF is developed by creating a relationship between support-like expenses (e.g., expenses for land, buildings, and computers that do not bring in direct product revenue), and revenue-producing investments and expenses. See Exh. VZ-37, Part G-6.

expenses are allocated equally across all investments dollar for dollar (Tr. 17, at 3508-3510; Verizon Brief at 109, citing Exh. VZ-38-A, at 17).

ii. CLEC Coalition

The CLEC Coalition argues that Other Support expenses are not exclusively related to investments and, thus, should not be recovered on the basis of investments. The CLEC Coalition also argues that Verizon's methodology has the effect of allocating a greater proportion of Other Support expenses to certain types of investments than to others, even if there is no basis for such asymmetrical allocation. The CLEC Coalition claims that Other Support expenses should be recovered as a percentage mark-up on expenses rather than as a factor applied to investments (Exh. CC-13, at 30-32). In addition, the CLEC Coalition argues that Verizon's land and building expenses[63] are overstated because the denominator (central office equipment investment) is understated with application of the FLC (CLEC Coalition Brief at 37).

b. Analysis and Findings

We agree with Verizon that the CLEC Coalition's analysis is flawed in that the CLEC Coalition incorrectly assumes that the five percent Other Support factor expressed in terms of an expenses-to-investments ACF will remain the same when restated in an expenses-to-expenses ACF. The CLEC Coalition fails to recognize that when Other Support expenses are restated as an expenses-to-expenses ACF, Other Support expenses are recovered from both

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63 The Land and Building factor ("L&B") identifies an amount of land and building investment that is required to support equipment housed in central offices. It is calculated by dividing investments in L&B by the investments in central office equipment.

recurring and nonrecurring costs, and what the CLEC Coalition claims is over-recovery is actually the amount of expenses that would be recovered through non recurring costs if calculated using the CLEC Coalition's methodology (see RR-DTE-55; see also RR-DTE-95). We also agree with Verizon that the methodology of allocating Other Support expenses in proportion to the level of investment is fair and reasonable. Allocating an equal amount of Other Support expenses to the various accounts that have a different level of investment will result in an account with low investment sharing a disproportionately high amount of Other Support expenses.[64] Finally, since we adopted the FLC, the CLEC Coalition's argument concerning land and building expenses is moot.

8. Wholesale Marketing ACF[65]

a. Positions of the Parties

i. Verizon

Verizon argues that as facility-based carriers already provide alternatives to the use of Verizon's network, Verizon will be required to engage in advertising designed to capture UNE customers in a forward-looking environment. Verizon states that its forward-looking advertising initiatives will likely consist of general market-stimulation advertising, brand awareness, and facility provider-to-CLEC advertising. Verizon contends that market

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64 According to an example Verizon provided, and which we agree with, if Digital Switching investments amounted to $1,000,000 and Buried Fiber Investments amounted to $100,000, then $58,000 of Other Support expenses would be allocated to digital switching and $5,800 would be allocated to Buried Fiber. See Exh. VZ-38-P at 17.

65 According to Verizon, Wholesale Marketing ACF is developed by creating an expense relationship between marketing-like expenses (e.g., Product Management, Sales and Advertising) and revenue-producing investments. See Exh. VZ-37, Part G-4.

stimulation-advertising and brand awareness advertising are advantageous for both wholesale and retail providers, because wholesale providers have a legitimate interest in encouraging brand awareness and loyalty, which generates direct retail revenues and indirect wholesale revenues (Verizon Brief at 107-108, citing Exh. VZ-38-A, at 18-20).

Verizon states that it has used the 1999 Verizon-East regional advertising budget, adjusted by avoided retail costs, as a reasonable proxy, because there is no other basis for estimating the wholesale marketing budget of the future. Verizon claims that using an expense relationship based on Verizon's 1999 retail advertising budget is a fair estimate of its forward-looking wholesale advertising budget since its advertising budget will not decrease when Verizon faces new retail and wholesale competition (id. at 108, citing Exh. VZ-36, at 49).

Verizon argues that the CLECs assume a forward-looking, hyper-competitive, efficient market in support of the lowest input values for most of their recommended inputs, while abandoning competitive market assumptions when such assumptions increase expenses. Verizon argues that current advertising expenses are irrelevant to the determination of the forward-looking expenses that would be incurred in the fully competitive wholesale market that is contemplated by TELRIC principles. Verizon asserts that evidence of wholesale competition and advertising currently exists, and it is reasonable to conclude that wholesale advertising expenses will increase substantially (Verizon Reply Brief at 46-47).

Verizon contends that the Department's decision in the Consolidated Arbitrations to exclude wholesale advertising expenses was based on the fact that there were no competitive UNE providers, which is no longer the case today. Verizon asserts that since it has introduced examples of wholesale competitors that are engaged in advertising and has explained in detail the need for such advertising, the Department needs to evaluate this issue in the current environment (id. at 48-49).

ii. AT&T

AT&T argues that to be consistent with the Department's findings in the Consolidated Arbitrations Phase 2 Order, Product Management, Sales, and Product Advertising Expenses for wholesale services must be set to zero. AT&T claims that Verizon has failed to prove that it would have to conduct any advertising in connection with the provision of UNEs on a wholesale basis. AT&T claims that Verizon also fails to recognize that it is the only provider of wholesale UNEs, and, thus, that CLECs do not need Verizon's advertising in order to determine from which carrier to purchase UNEs. AT&T asserts that Verizon's market stimulation and brand awareness argument was rejected in the Consolidated Arbitrations (AT&T Brief at 51, citing Phase 2 Order at 19-20).

iii. WorldCom

WorldCom argues that Wholesale Advertising expenses should not be allowed. WorldCom contends that Verizon is attempting to collect money from CLECs for its imaginary advertising. WorldCom argues that Verizon cannot show any specific examples of its claimed advertising for market stimulation or brand awareness, and even if there were such advertising, it would benefit Verizon (WorldCom Brief at 70-71).

iv. CLEC Coalition

The CLEC Coalition argues that the Wholesale Marketing Factor is methodologically flawed, because it is a shared cost that is inappropriately covered through a cost factor. The CLEC Coalition also argues that advertising costs should not be allowed, because Verizon has never advertised UNEs and has failed to provide any valid support that advertising is necessary. With respect to Verizon's claim that brand awareness advertising benefits the CLECs, the CLEC Coalition contends that Verizon's claim – that its name would become a competitive advantage for the CLECs whose service offerings make use of Verizon's network rather than an alternative provider's network – is unsupported. The CLEC Coalition claims that wholesale advertising expenses are Verizon's attempt to charge CLECs for expenses that are designed to enhance the value of the Verizon's trademark at the same time that Verizon contractually restricts CLECs from exploiting that trademark (CLEC Coalition Brief at 32-35).

b. Analysis and Findings

AT&T raises objections to the recovery of wholesale Product Management and Sales expenses. Because Verizon treats Sales Expenses as 100 percent avoided in its proposal, AT&T's claim that wholesale Sales Expenses should be eliminated is moot (see Exh. VZ-37, Part G-1 (Avoided-Cost Study), Tab 1, Account 6612 (Sales); see also Exh. VZ-37, Part G-4 (Marketing Factors), Tab 2, line 11).

Concerning wholesale Product Management expenses, we stated in the Order opening this investigation that we would maintain the status quo on the use of the FCC=s avoided-cost method (i.e., "avoidable costs"), despite regulatory uncertainty surrounding it. Vote and Order at 7. The status quo in Massachusetts is the use of "avoidable" expenses. Based on that decision, in Section V.C.4 (Retail-Related Expenses), we direct Verizon to revise its ACFs to exclude all retail-related expenses (i.e., "avoidable" costs). Accordingly, consistent with our ruling in Section V.C.4, Verizon shall revise its proposed "avoided" costs discount of 40.42

percent in Product Management (see Exh. VZ-37, Part G-1 (Avoided-Cost Study), Tab 1, Account 6611 (Product Management)) using the current "avoidable" cost discount.

Now we turn to wholesale advertising expenses. The FCC established pricing rules that should produce rates for monopoly elements and services that approximate what the ILECs would be able to charge if there were a competitive market for such offerings. See Local Competition Order at ¶ 738. When we determine UNE rates, it is of critical importance to maintain consistency between assumptions that affect multiple UNEs. A party in this case should not be able to pick and choose different assumptions for different UNEs, depending on whether the assumption produces results favorable to its position. In Sections V.A (Cost of Capital) and Section VI.C (Fill Factors), we assume a level of efficiency that simulates the conditions in a competitive market. Thus, the competitive market assumption should be applied in determining ACFs. Applying that assumption, we find that Verizon should be allowed to recover expenses for wholesale advertising. The existence of alternative UNE providers may not be the only factor that necessitates wholesale market advertising. It is also reasonable to assume that ILECs may engage in wholesale advertising to persuade CLECs that choosing ILECs' UNEs is a more attractive option than building their own facilities. Therefore, facilities-based competition in retail services may be considered relevant when evaluating wholesale advertising expenses.

In addition, the record shows that ILECs, including Verizon, are engaging in wholesale advertising activities (Exh. CC-VZ 2-40; RR-DTE-96-S). In RR-DTE-96-P, Verizon provides information on wholesale advertising expenses it spent in year 2001 and its budget for year

2002. This documentation shows that the wholesale advertising activities have increased considerably since the Department's last UNE case in 1996.

However, we disagree with Verizon that an expense relationship based on Verizon's 1999 retail advertising budget is a fair estimate of its forward-looking wholesale advertising budget. The record evidence on competition shows a much greater level of retail competition, which consists of resale and UNE-based competition in addition to network-based competition, than wholesale competition (Exh. VZ-3; RR-DTE-1; RR-DTE-3). Also, retail advertising is conducted intensively through television or radio, advertising media that are considerably more expensive than print advertising and which target the general public. We do not believe that companies would use television or radio as advertising media to stimulate business-to-business transactions (in case of telecommunications markets, ILEC-to-CLEC business transactions) as they would with retail customers. Therefore, we direct Verizon to use its wholesale advertising budget in Massachusetts for year 2002 as the basis for a revised wholesale advertising factor.

VI. OUTSIDE PLANT INPUTS

A. Introduction

Within the boundaries of each wire center, the wires and other equipment that connect the central office to the customers' premises are known as outside plant. Inputs Order at ¶ 13. The FCC states that as OSP constitutes the largest portion of total network investment, sizing OSP properly is critical in calculating the appropriate amount of investment. The FCC also states that as the design of outside plant facilities depends heavily on customer locations, it is important to have accurate information about customer locations relative to the wire center. See Platform Order at ¶ 91 n.182; see also Inputs Order at ¶ 64.

B. Inputs for Basic Loops

1. Average Distribution Loop Length

a. Positions of the Parties

i. Verizon

Based on data collected from the engineering survey discussed in Section IV (Cost Models), above, Verizon identifies the longest distribution segment of the loop in each distribution area ("DA") and assumes that the average loop length is one-half of the longest distribution portion of the loop of each DA. Verizon argues that the assumption is reasonable because each DA covers a relatively small area and the customer locations within urban and suburban DAs are generally evenly distributed. Verizon claims that its assumption produces underestimation because each DA has a contiguous geographic shape, and thus there are more customer locations (approximately 60 percent) with distribution pairs that are longer than one-half of the longest distribution length (Verizon Brief at 68-69, citing Exh. VZ-38-A, at 35-36; Tr. 9, at 1837-1839).

Verizon also states that in the unusual instance where the distribution portion of the loop could be excessive, Verizon excludes that information from its analysis, and thus outliers could not improperly affect Verizon's loop length estimate (id. at 69 n.56). Verizon argues that the Department should reject Dr. Ankum's recommendation of an 8.7 percent reduction in Verizon's average distribution loop length because it was based on the analysis that he conducted in a New Jersey UNE rates proceeding – an analysis that the New Jersey Board of Public Utilities ("BPU") severely criticized and rejected (id. at 70).

ii. AT&T/WorldCom

AT&T argues that Verizon's assumption of the average distribution loop length is arbitrary. AT&T contends that Verizon is unable to provide any data, documentation, or analysis to support its assumptions of the average distribution loop length or "uniform distribution of customers" (AT&T Brief at 145). WorldCom concurs with AT&T (WorldCom Brief at 55, citing Tr. 9, at 1835-1838). WorldCom argues that the Department criticized the assumption of even dispersion of customers in the Consolidated Arbitrations proceeding and the HAI provides the best evidence of actual loop lengths given that HAI is based on geocoded customer location data (id. at 56-57, citing Phase 4 Order at 21). WorldCom argues that Verizon fails to propose loop lengths that represent the most efficient OSP configuration, and that Verizon also fails to prove that its proposed loop lengths accurately reflect the actual loop lengths in its embedded network. WorldCom claims that Verizon's extremely small sample size of distribution areas strongly suggests that Verizon engaged in cherry picking to skew the results in its favor (WorldCom Reply Brief at 41-42).

iii. CLEC Coalition

The CLEC Coalition argues that Verizon's average distribution loop length assumption leads to overestimation if there is a significant number of short loops and if the longest loop is an outlier. The CLEC Coalition also contends that if there is a larger concentration of customers clustered around the Feeder Distribution Interface ("FDI"), Verizon's assumption of even distribution of customers leads to over-estimation as well. The CLEC Coalition contends that Verizon does not take into account the forward-looking design that moves the remote terminal ("RT") and the FDI further into the DA to minimize copper facilities.

The CLEC Coalition claims that Verizon-New Jersey ("Verizon-NJ") used the same assumption, and its witness, Dr. Ankum, calculated that the average length should be reduced by 8.7 percent in the New Jersey proceeding. According to the CLEC Coalition, Verizon's claims that Dr. Ankum's analysis was severely criticized is entirely unsupported, and it is reasonable to assume that Verizon's method may result in the same overestimation as Verizon-NJ; thus Verizon's proposed average distribution loop lengths should be reduced by 8.7 percent (CLEC Coalition Brief at 68-69, citing Exh. VZ-38, at 36, 54, Exh. CC-3, at 59; CLEC Coalition Reply Brief at 10-12).

b. Analysis and Findings

Verizon makes two assumptions with respect to distribution loop length: (1) in general, the customer locations within distribution areas are uniformly distributed; and (2) the average loop length is one-half of the longest distribution portion of the loop of each distribution area. The HAI 5.2a-MA Model's estimate of average distribution loop length is also based on the uniform distribution of customers.[66] The FCC conducted an analysis to determine the impact of a uniform distribution approach on distribution loop plant. The analysis showed that a uniform distribution assumption can create an apparent systematic downward bias in the required amount of distribution plant that is constructed in less dense areas. See Platform Order at ¶¶ 57-60. We find the FCC's analysis on this point to be persuasive and applicable

[66] The HAI 5.2a-MA Model designs OSP by modifying the DAs so that they have rectangular dimensions and by relocating customers so that they are distributed evenly within a DA.

here. Therefore, we find that Verizon's assumption of a uniform distribution of customer locations introduces underestimation of distribution loop plant and, thus, results in some underestimation of distribution loop length.[67]

The question then is whether Verizon's second assumption (i.e., that the average loop length is one-half of the longest distribution portion of the loop of each distribution area) produces upward bias, and, if so, whether any possible upward bias resulting from the second assumption cancels out the downward bias resulting from Verizon's first assumption. Dr. Ankum claims that Verizon's second assumption does in fact produce upward bias and overestimates distribution loop length by 8.7 percent. However, we have reservations with Dr. Ankum's proposal. First, it is based on an analysis he conducted in the New Jersey proceeding. As we stated in Section III (Economic Issues), above, we give little or no weight to proposals solely based on an outcome from another jurisdiction. In addition, the CLEC Coalition does not dispute Verizon's claim that the New Jersey BPU rejected Dr. Ankum's proposal, which further undermines the reasonableness of his proposal. Second, it appears that Dr. Ankum did not make a downward adjustment to his proposed 8.7 percent estimate to account for underestimation that results from the uniform distribution assumption. Third, as Verizon reasonably explains, a small-sized DA and exclusion of outliers in determining loop length further reduce the possibility of upward bias. For these reasons, even if we assume that

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[67] The HAI 5.2a-MA Model introduces a "strand distance normalization" function to address the concern that the HAI 5.2a-MA's assumption of uniform distribution of customers underestimates loop lengths. However, the record does not contain evidence to show that strand normalization produces enough loop facilities to compensate for the underestimation and to accommodate natural obstacles and other constraints that carriers face when deploying loop plant (see Tr. 14, at 2832- 2840).

the 8.7 percent overestimation from Verizon's second assumption is correct, it should be adjusted downward to account for underestimation from Verizon's first assumption. However, any relevant downward adjustment in distribution loop length would not have a material impact on loop costs; the record shows that a five percent reduction in Verizon's proposed average distribution loop length lowers distribution loop costs by a negligible amount (see RR-DTE-92). Therefore, we adopt Verizon's proposed average distribution loop length.

2. Average Feeder Loop Length (Feeder Routing)

a. Positions of the Parties

i. Verizon

Verizon states that its loop cost model relies on data culled from a detailed engineering survey of the existing network, and that the existing loop routes and structures are efficient and provide the best estimate of what a carrier would build in order to serve demand in Massachusetts (Verizon Brief at 64, citing Exh. ATT-VZ 14-31, Exh. ATT-VZ 14-33). Verizon asserts that, given the state's geography and the static location of the network's wire centers, customers, existing building locations, and roadways, there is no reason to assume that the existing routes and structures would not represent the most efficient means of reaching customers (id. at 65-66).

With respect to AT&T/WorldCom's argument that Verizon's reliance on the existing layout and topology violates TELRIC principles because it is based on an "embedded" network design, Verizon contends that CLECs have neither provided evidence to show that there would be a more efficient network than the existing one, nor suggested any specific adjustments to Verizon's existing network characteristics (id. at 67-68, citing Exh. ATT-24, at 10-14; Tr. 9, at 2183-2185). Verizon claims that even if changes in road locations provide opportunities to shorten existing feeder routes relative to the existing one, such changes would involve costs so unreasonable as to overwhelm any cost savings (id. at 67, citing Tr. 9, at 1833; Exh. VZ-38-A at 24-25). Verizon goes on to say that new routes built today would, for logical consistency, have to reflect many factors such as municipal requirements that make the establishment of new routes much more costly and much less efficient (id. at 67).

Verizon asserts that the Department rejected AT&T's argument in a prior proceeding in which the Department correctly noted that TELRIC requires a "forward-looking technology approach to costing with the reality of physical distribution of existing customers and central offices" (id. at 65, citing Phase 4 Order at 13-14).

ii. AT&T

AT&T states that TELRIC assumes the current wire center locations, but otherwise models a forward-looking, most efficient network design. AT&T argues that Verizon did not undertake any analysis to confirm its arbitrary assumption that the average feeder lengths in a reconstructed network would be identical to the existing average feeder lengths. AT&T claims that Verizon's proposed network is nothing more than a "mirror image" of its current network and is thus inconsistent with TELRIC (AT&T Brief at 144, citing Exh. ATT-23, at 12). WorldCom supports AT&T's position (WorldCom Brief at 37, citing Exh. ATT-VZ 14-32).

b. Analysis and Findings

AT&T's argument is based on the assumption that a forward-looking network, if built today, would have shorter feeder loops, and would therefore be less expensive. We find this assumption to be flawed. While some feeder loops would be shorter if built today, there would be a situation where feeder loops, if built today, would be longer because of obstacles that came into existence after the construction of Verizon's existing network. A physically reconstructed feeder loop network might also be more expensive for reasons unrelated to feeder loop length, such as the cost of securing rights-of-ways and complying with municipal requirements. We agree with Verizon that Verizon's reliance on existing feeder routes actually lowers costs by, for example, giving CLECs the benefit of the rights-of-way costs that Verizon incurred in building its existing network as compared to the higher costs of securing such rights-of-way today.

In the Universal Service Order at ¶ 250, the FCC provides ten criteria that a forward-looking economic cost study or model must meet. In the first criterion, the FCC states that the study or model's loop length should reflect the incumbent carrier's actual average loop length. Although the FCC cautions parties from using the inputs values adopted for federal universal service support for any other purposes in the Inputs Order, the general principles that a forward-looking cost model must meet are applicable to a model used for UNE rates. We provided the parties with the first criterion during the hearings and no party suggested that this criterion does not apply to a forward-looking cost study for UNE rates (Tr. 11, at 2182-2193). Judging from the fact that the FCC suggests using the actual average loop lengths, we do not think that the FCC envisions rerouting existing loop plant in a forward-looking economic costs study. We conclude that a "reconstructed network" under TELRIC principles should be read as a technologically reconstructed network rather than a physically rerouted network. See discussion in Sections II (Standard of Review) and III (Economic Issues), above.

Department precedent also supports using actual average loop lengths in a forward-looking economic cost study. The Department stated in the Consolidated Arbitrations, as a reason to adopt Verizon's model, that Verizon's model is based on a random sample of actual loop plant from existing wire centers, and it therefore presented a stronger resemblance to "the actual layout of loops." Phase 4 Order at 21. Although the CLECs argue that TELRIC principles require rerouting of feeder facilities, they do not make any suggestion as to how to conduct a study of rerouting or provide a specific methodology for doing so. The CLECs' proposal would require, every five years when the Department investigates UNE rates, conducting a study of rerouting in order to take into account the change of topology – a task that would require Herculean efforts and offer no present promise of a more valid result. In addition, the average feeder lengths in the HAI 5.2a-MA are even longer than Verizon's proposals (see Exh. ATT-VZ 2-5; see also RR-DTE-80). Therefore, for all of the reasons described above, we adopt Verizon's proposed feeder loop lengths.

3. Technology Mix for Feeder: Copper vs. Fiber

a. Positions of the Parties

i. Verizon

Depending on the distance involved, and the density of the customers being served, Verizon determines whether to deploy copper or fiber in the feeder portion of its network. The copper/fiber threshold is the distance at which Verizon assumes the use of fiber rather than copper in the feeder. The resulting copper-fiber thresholds for each density zone are as follows: Metro, all fiber; Urban, fiber over 4,000 feet; Suburban, fiber over 5,000 feet; and Rural, fiber over 10,000 feet. These thresholds in turn yield a 20 percent copper and 80 percent fiber mix for feeder technology (Verizon Brief at 70-71, citing Exh. ATT-VZ 4-25; Tr. 17, at 3362, 3367-3368, 3473-3474).

Verizon claims that its feeder technology mix reflects the most forward-looking, cost-optimizing technology mix that would exist if Verizon's entire network were to be reconstructed today. Verizon also argues that the use of different thresholds for different density zones reflects the fact that high customer concentration and loop distance are determinants for establishing an economic copper-fiber threshold (id. at 71). Verizon asserts that the CLECs did not criticize or question Verizon's copper-fiber threshold assumption (id. at 72, citing Exh. CC-3, at 60). With respect to the 100 percent fiber assumption in the Metro zone, Verizon argues that its engineering guidelines and the need for survivability and increased bandwidth support all fiber feeder in the Metro zone (id. at 73, citing Exh. VZ-38A at 52). Verizon argues that the use of copper only in Metro zone as recommended by Dr. Ankum would substantially reduce technological choices for those customers closest to the CO (id. at 73).

ii. AT&T

The HAI 5.2a-MA deploys fiber where: (1) the feeder length is greater than 9,000 feet; (2) fiber is the more economic choice for feeder distances less than 9,000 feet based on a life-cycle cost minimization analysis; and (3) the total loop length for the customers in a given cluster that are furthest from the wire center exceeds 18,000 feet. The resulting copper/fiber feeder mix is 51 percent and 49 percent, respectively (Exh. ATT-25, at 36). AT&T contends that the only data Verizon presented in support of its thresholds are completely arbitrary and based on an embedded network (AT&T Brief at 145-146, citing Exh. ATT-VZ 4-25). AT&T

contends that using Universal Digital Loop Carrier ("UDLC") technology to provision unbundled loops over fiber feeder negates whatever efficiencies may have been achievable through increased fiber use (AT&T Reply Brief at 88).

iii. CLEC Coalition

The CLEC Coalition argues that Verizon should assume the same copper-fiber threshold of 4,000 feet in the Metro zone as it does in the Urban zone. The CLEC Coalition claims that Verizon's 100 percent fiber feeder assumption for the Metro zone is neither necessary nor a least cost, forward-looking choice. The CLEC Coalition contends that although fiber itself may be inexpensive, remote terminal ("RT") and Central Office Terminal ("COT") equipment are expensive, the use of which cannot be justified on shorter loops in the Metro zone. The CLEC Coalition argues that Verizon's own study shows that the average loop length in the Metro zone is less than half of the average loop length in the Urban zone.

With respect to Verizon's claim that high density in the Metro zone and the demand for increased bandwidth justifies 100 percent fiber, the CLEC Coalition maintains that there is still a large number of residential buildings that can be served on copper cables more efficiently than on fiber cables, and that Verizon is, in fact, meeting Metro zone customers' demand with copper. The CLEC Coalition asserts that RR-DTE 89 shows that when a 9,000 feet threshold is used, Verizon's loop cost drops from $9.10 to $5.60 in the Metro zone (CLEC Coalition Brief at 70-72).

b. Analysis and Findings

The record shows that a 9,000 feet threshold produces loop costs lower than Verizon's proposed thresholds (RR-DTE-89).[68] First, we will discuss the outputs that the CLECs' proposed thresholds (9,000 feet and 4,000 feet) would produce in the Metro zone. Using a 9,000 feet threshold in the Metro zone results in 98 percent copper feeder and 2 percent fiber feeder, which is tantamount to rolling back the actual 22 percent fiber that exists in the Metro Zone (see Exh. ATT-VZ 4-25, Att. A, column "Total Pair Gain/Total Lines," Att. B, column "Metro Zone Cum."; see also Exh. DTE-VZ 1-5, Att.). Because fiber deployment will only increase to meet the demand of increased bandwidth in a forward-looking environment, it is counterintuitive that fiber in the Metro zone would decrease from 22 percent to 2 percent in a forward-looking network. Thus, although a 9,000 feet threshold results in lower loop costs in the Metro zone, we do not find it to be an appropriate threshold for use in the Metro Zone in a forward-looking network. As the Department stated in Phase 4 Order at 22, a cost model should not provide a counterintuitive result.

We disagree with the CLEC Coalition's claim that copper should be used in the Metro zone because Verizon is in fact meeting the Metro zone customers' demand with copper. Whether Verizon is currently serving these customers over copper is irrelevant, because we assume a new network built from scratch under TELRIC principles. In addition, cost is not

[68] In RR-DTE-89, we requested that Verizon re-run its LCAM using 9,000 feet thresholds to simulate the thresholds proposed by the HAI 5.2a-MA. However, we note that a 9,000 feet threshold is one of several elements that the HAI 5.2a-MA takes into account in a life-cycle analysis. Therefore, the output of re-running Verizon's LCAM with a 9,000 feet threshold does not exactly correspond to the output of the HAI 5.2a-MA using the same threshold.

the only factor in determining TELRIC-compliant technology. It should be capable of meeting forward-looking demand, i.e., the demand of increased bandwidth. As the FCC notes, even though fiber can be more expensive than copper in shorter loop lengths, the use of fiber can be consistent with TELRIC. Pennsylvania 271 Order at ¶ 59.

No CLEC challenges Verizon's claim that density and loop length are determinants when choosing between copper and fiber. The CLEC Coalition acknowledges the fact that it is more efficient to use fiber feeder for high-rise buildings where high density warrants fiber feeder (see CLEC Coalition Brief at 71).

Despite the CLEC Coalition's admission that the high density of high-rise buildings warrants fiber feeder, its proposed 4,000 feet threshold would result in high-rise buildings being served on copper. The record indicates that high-rise buildings are assumed to have dedicated RTs on the premises and contain only house and riser cables, in most cases (see RR-DTE-91-S). For these reasons, it is reasonable to assume that high-rise buildings have loops much shorter than loops serving residential customers and, thus, fall within the under-4,000-feet threshold for copper feeder. In addition, the Metro zone is populated primarily by large business customers whose bandwidth requirements are best served over fiber facilities. For all of the reasons discussed above, we adopt 100 percent fiber (i.e., zero threshold) in the Metro zone, as proposed by Verizon.

For the remaining three zones, we direct Verizon to use a 9,000 feet threshold because the record demonstrates that this threshold minimizes going-forward costs (RR-DTE-89). Using a 9,000 feet threshold in the three remaining zones still yields a percentage of fiber significantly higher than Verizon's existing fiber proportion in each zone. Therefore, we conclude that in the three remaining zones, a 9,000 feet threshold yields less expensive but still forward-looking results that are not counterintuitive.[69] We direct Verizon to revise its proposed thresholds in the three zones (the Urban, the Suburban, and the Rural zones) to 9,000 feet. Based on the record in this proceeding, we estimate that a zero threshold in the Metro zone and a 9,000 feet threshold in the remaining three zones yield approximately 41.2 percent copper and 58.8 percent fiber.[70]

4. Fiber Feeder Technology Choice: UDLC vs. IDLC

a. Positions of the Parties

i. Verizon

Verizon proposes 25 percent IDLC and 55 percent UDLC for fiber feeder technology. Verizon contends that 25 percent IDLC penetration is aggressively forward-looking, represents a far greater level than is likely ever to exist in its network, and gives the CLECs the benefit of the lower costs of IDLC even if a GR-303[71] interface does not exist in Verizon's current

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69 Fiber proportions in Verizon's existing network are 14.3% (Urban), 19.3% (Suburban), and 16.3% (Rural) (Exh. DTE-VZ 1-5, Att.). A 9,000 feet threshold yields a fiber proportion in each of the three zones as follows: 47.12% (Urban), 62.14%(Suburban), and 59.86% (Rural) (Exh. ATT-VZ 4-25, Att. B, column "Zone Cum.").

70 Those thresholds (the Metro: zero feet; and the remaining three zones: 9,000 feet) yield the copper percentage in terms of the total universe as follows: 0 (Metro) + 20.72 (Urban) + 18.60 (Suburban) + 1.89 (Rural) = 41.21%. The fiber percentage out of the total universe is: 7.04 (Metro) + 18.45 (Urban) + 30.51 (Suburban) + 2.79 (Rural) = 58.79 % (Exh. ATT-VZ 4-25, Att. B, column "Total Universe Cum.").

71 GR-303 is a set of technical specifications from Telcordia for a next generation IDLC architecture. Newton's Telecom Dictionary, 17th ed. at 310.

network and it has no plan to deploy the technology (Verizon Brief at 74; Verizon Reply Brief at 95).

Verizon counters the CLECs' argument that all fiber loops should be served over IDLC with GR-303 interface because: (1) IDLC and UDLC are not perfect substitutes for each other; (2) IDLC has inherent limitations, and is not a better or more advanced technology than UDLC; and (3) two-wire analog UNE loops cannot be provisioned over IDLC with a GR-303 interface, and, thus, UDLC is necessary. Verizon explains that the technology required to provision unbundled stand-alone loops using GR-303 is not commercially available from any supplier and has not been deployed by any ILEC. Verizon claims that despite CLECs' discussions on the documents that show how IDLC GR-303 unbundling could take place, IDLC GR-303 unbundling remains in the realm of the theoretical (Verizon Brief at 73-79). Verizon states that a letter from telecommunications equipment supplier Alcatel (Exh. VZ-18) shows the technical infeasibility and other impediments that still prevent such unbundling from becoming a reality and argues that even AT&T's own witness admitted that no carrier anywhere in the country is presently unbundling with a GR-303 interface. Furthermore, Verizon states that CLECs do not include any allowance in their loop cost proposal for the costs of OSS or equipment solutions that would be necessary to provide UNE loops using GR-303 (Verizon Brief at 73-79). Verizon states that TELRIC cost estimates should be based on a technology that can be realistically deployed on a forward-looking basis, not on a speculative technology that does not exist but which may hold a promise of cost savings, or on a technology that cannot be reasonably deployed to provide the specific required services.

Verizon claims that the CLECs' proposal on all fiber loops on IDLC GR-303 is merely an attempt to generate lower UNE rates without regard to the FCC's rules (id.).

Verizon contends that the CLECs ignore the inherent limitation of IDLC technology. Verizon asserts that UDLC is necessary to provide services other than unbundled loops regardless of whether stand-alone loops can or cannot be unbundled using an IDLC interface (Verizon Reply Brief at 96-99, citing Tr. 9, at 1582, 1850-1853). Verizon claims that the CLECs' argument of technical feasibility of unbundling IDLC loops at the DS1 level begs the question, because the CLECs seek to provision stand-alone loops (DS0), not DS1 loops.[72] Verizon asserts that there is no sound technological basis for the CLECs' proposal that loop costs should be measured as if such GR-303 unbundling capabilities exist at no cost (id. at 99-100).

With respect to the CLECs' claim that Verizon uses a narrow definition of unbundled loops to avoid its obligation to provide UNE loops, Verizon claims that a technical description is used to describe the specific service that CLECs are requesting when they purchase an unbundled loop. Verizon asserts that the definition of what constitutes an unbundled loop is relevant to the issue of technical feasibility of the provision of that loop because the cost to provision unbundled loops should be based on the forward-looking technology capable of provisioning the loops (id. at 103-104). Concerning the CLECs' claim that Verizon uses IDLC to provide loops to its retail customers while denying IDLC to interconnecting CLECs, Verizon contends that CLECs benefit from cost reductions because Verizon prices UNEs based

72 Twenty-four DS0 loops are combined to make up a DS1 loop.

on an aggressive assumption of IDLC, although it is actually providing UNEs over its existing network which has less IDLC than Verizon's TELRIC study assumes (id. at 104-105).

Verizon objects to the CLECs' claim that it has an incentive to resist the introduction of IDLC with GR-303 technology and that the existence of the systems to support unbundling is irrelevant in determining UNE rates. Verizon argues that it is unreasonable for the CLECs to suggest that Verizon would refuse to avail itself of a technology that would reduce its costs to serve its customers and that the existence of a system to support unbundling is a real consideration for both ILECs and vendors of IDLC. Verizon asserts that regardless of the impediments, TELRIC requires the use of currently available technology (id. at 105-106).

Verizon also objects to AT&T's proposal that UNE-P rates should be based on 100 percent IDLC. Verizon argues that the proposal is an attempt to isolate one of three technologies and establish a price for UNE-P based on that technology, regardless of how UNE-P will actually be provisioned in a forward-looking network. Verizon contends that the proper way to establish UNE rates is based upon a blended rate for all UNE loops, reflecting relative proportions of IDLC, UDLC, and copper that will be encountered in a forward-looking network (id. at 106-107).

ii. AT&T/WorldCom

AT&T argues that Verizon attempts to deny loops provisioned over IDLC at the DS1 level based on a narrow definition of "loop" as a two-wire analog loop. AT&T contends that IDLC loops unbundled at the DS1 level should be used as the basis for setting TELRIC-compliant rates, because unbundling is technically feasible to do and because unbundled IDLC loops fall within the FCC's definition of loops. AT&T claims that the fact that Verizon does not do it that way today and, therefore, defines interconnection with a two-wire loop differently, is irrelevant for the purpose of setting forward-looking UNE rates (AT&T Brief at 121-122).

AT&T argues that Verizon inflates loop rates by using UDLC, a more expensive and less efficient technology than IDLC. AT&T claims that, as RR-DTE-51 clearly shows, where Verizon ran the LCAM under different assumptions of IDLC/UDLC, UDLC technology substantially increases monthly loop costs. AT&T claims that UDLC is less efficient because it goes through multiple conversions between digital and analog signals, doubles the cost of line cards, and necessitates non-recurring charges due to the need for cross connection at the Main Distribution Frame ("MDF").

AT&T contends that the Telcordia[73] document, submitted as RR-DTE-81, shows a number of options for IDLC unbundling and interconnection using GR-303 technology. AT&T argues that, according to the document, it is technically feasible to unbundle IDLC loops and permit a DS1 level cross-connection, and, thus, IDLC is the network design that must serve as the basis for setting TELRIC-compliant rates. AT&T contends that Verizon acknowledged that protocols for unbundling IDLC loops could be developed. AT&T also contends that whether the systems to administer unbundled IDLC currently exist has no bearing on the setting of forward-looking costs (id. at 114-125).

AT&T claims that the fact that no ILEC has yet widely offered IDLC unbundling merely reflects the incentive to erect a barrier to entry against CLECs by provisioning UNEs in a costly and inefficient manner, and, thus, it is a question of strategy rather than technical

[73] Telcordia is a telecommunications consulting firm formerly known as Bellcore.

feasibility. AT&T urges the Department to estimate UNE rates based on the forward-looking technology that will be in place to implement IDLC unbundling, as described in Telcordia's technical papers (id.). AT&T argues that even if Verizon claims that some amount of UDLC is needed to serve stand-alone unbundled loops and non-switched private-line arrangements, Verizon provides no justification for assuming such a high share of UDLC. AT&T argues that the UDLC proportion should not be more than Verizon's own forecast of the total number of wholesale UNE loops[74] in a forward-looking environment (AT&T Reply Brief at 85-86, citing Exh. ATT-VZ 4-29-2S).

Finally, AT&T argues that UNE-P costs should be based on 100 percent IDLC. AT&T contends that Verizon's justification for assuming UDLC for unbundling UNE loops makes even less sense, because Verizon admits that IDLC loops could be provisioned to a CLEC using UNE-P. AT&T also states that Verizon currently performs signal transfers at the DS1 level from its own fiber-fed loops to its own switches using IDLC (AT&T Brief at 125-126).

WorldCom supports AT&T's position in general (WorldCom Brief at 44-47). In addition, WorldCom argues that whether Verizon has plans or projections to install GR-303 technology or whether Verizon's existing network is compatible with GR-303 does not refute the fact that GR-303 is the most efficient, least-cost technology. WorldCom contends that the letter from Alcatel that Verizon cited only confirms that the technology to unbundled IDLC loops is "available," and what is missing is a commercially available product designed to "apply" that technology in a manner that suits the needs of a multi-carrier environment (id.).

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74 Because the forecast of wholesale UNE Loops is proprietary information, we do not quote the actual figure.

WorldCom asserts that Verizon has no incentive to address unresolved technical issues of IDLC unbundling because of the substantial impact it would have on Verizon's recurring and non-recurring rates. WorldCom claims that a new entrant that has not yet incurred outside plant investment costs would aggressively invest the time and resources to resolving IDLC unbundling issues, because the payoff in efficiency would be great, and that Verizon will never take the steps necessary to get IDLC unbundling to the market unless it is driven to do so by UNE rates imposed by regulators (id. at 42-47).

iii. CLEC Coalition

The CLEC Coalition proposes that all fiber loops should be based on IDLC. The CLEC Coalition argues that Verizon discriminates against CLECs by using IDLC to provide loops to its own retail customers while denying IDLC to CLECs. The CLEC Coalition contends that IDLC is more efficient and less expensive than UDLC, and the significant cost difference between IDLC and UDLC makes Verizon's retail services more attractive to customers than CLECs' services, thereby giving Verizon a competitive advantage.

The CLEC Coalition claims that the FCC requires UNE prices to be based on the most efficient technology currently available and deployed in the ILEC's current wire center locations. The CLEC Coalition asserts that IDLC is currently available as part of Verizon's own technology and has played an increasingly important role throughout Verizon's footprint. The CLEC Coalition claims that a majority of Verizon's fiber loops currently use IDLC rather than UDLC, and, thus, 100 percent IDLC is an appropriate forward-looking assumption (CLEC Coalition Brief at 57-64).

The CLEC Coalition states that the 100 percent IDLC assumption sends the correct price signals to ILECs and gives an incentive to ILECs to build an efficient network based on IDLC. The CLEC Coalition contends that if the Department continues to allow Verizon to assume the use of more expensive technology to be used by its competitors while it can use less expensive technology for its retail customers, Verizon would never employ less expensive technology for competitors (id.).

b. Analysis and Findings

First, we will address what constitutes a TELRIC-compliant technology. In the Local Competition Order at ¶¶ 683-685, the FCC addressed three general approaches to a forward-looking cost methodology. Although the FCC rejected the first two approaches, we discuss all three approaches here to provide context. Under the first approach, prices would be based on the most efficient network architecture, sizing, technology, and operating decisions that are operationally feasible and currently available to the industry. Although this approach replicates conditions in a highly competitive marketplace by not basing prices on existing network design and investment, the FCC expressed concern that this approach could discourage facilities-based competition by new entrants because new entrants can use an ILEC's existing network based on the cost of a hypothetical least-cost, most efficient network. Under the second approach, prices would be based on existing network design and technology that are currently in operation. The FCC dismissed this approach because it was essentially an embedded cost methodology that reflects inefficient or obsolete network design and technology. Under the third approach, prices would be based on "the most efficient technology deployed in the ILEC's current wire center locations" for reasonably foreseeable capacity requirements. The

FCC adopted this approach, stating that it mitigated ILEC's concerns that a forward-looking pricing methodology ignores existing network design, while basing prices on efficient, new technology compatible with the existing infrastructure. The FCC stated that this benchmark of forward-looking cost and an existing network most closely represents the incremental costs that incumbents actually expect to incur in making UNEs available to new entrants. In addition, the FCC stated that this approach encourages facilities-based competition to the extent that new entrants, by designing more efficient network configurations, are able to provide services at a lower cost than the ILEC.

In addition, in deciding on which approach to adopt, the FCC stated that a pricing methodology should be "pro-competition, not pro-competitor." Local Competition Order at ¶ 705. We read pro-competition as meaning that a pricing methodology should promote fair competition. Fair competition should not come at the expense of either ILECs or CLECs, and both embedded-cost based and hypothetically most efficient technology-based pricing methodologies would be pro-competitor[75] methodologies because they provide an unfair advantage to one side, i.e., ILECs in the former case and CLECs in the latter case. The FCC chose the third approach because it most closely reflects forward-looking costs that ILECs actually expect to incur and sends correct price signals to all competing carriers; it is a pro-competition methodology. The FCC also stated that the forward-looking economic costs of UNEs may be "higher or lower" than historical embedded costs. Id.

[75] The FCC uses the term "competitor" to indicate all competing carriers, including both ILECs and CLECs.

Now we turn to whether GR-303 with unbundling capability at the DS0 level is TELRIC-compliant. The parties generally agree that: (1) GR-303 with unbundling capability at the DS0 level is the least-cost technology; (2) GR-303 can unbundle loops at the DS1 level; (3) documents exist that show how GR-303 could unbundle stand-alone loops at the DS0 level; (4) the systems necessary to support unbundling loops at the DS0 level with GR-303 are currently not available; and (5) no carrier is using IDLC with GR-303 to provision stand-alone unbundled DS0 loops anywhere in the country. However, the parties disagree on whether GR-303 with unbundling capability at the DS0 level is a technology the FCC considers TELRIC-compliant. For the reasons discussed below, we find that GR-303 with unbundling capacity at the DS0 level does not satisfy the third approach adopted by the FCC, i.e., that UNE rates should be based on the most efficient technology that is currently being deployed, rather than the hypothetically most efficient technology currently available in the industry but not being deployed.

We do not believe that a technology that is not currently deployed by any carrier in the industry and still has unresolved technical issues can be viewed as "currently being deployed in the ILEC's current wire center locations." Even if we assume that IDLC with GR-303 capable of unbundling loops at the DS0 level is "available in the industry," it is not a technology that UNE rates should be based on. In rejecting the first approach, the FCC clearly distinguished between the most efficient technology currently being deployed in the ILEC's wire centers and hypothetically the most efficient network based on a technology currently available in the industry. TELRIC principles require that forward-looking costs be calculated based on a currently deployed technology, rather than technology that is potentially deployable in the future. The record shows that IDLC with unbundling capability at the DS0 level still remains a potential, rather than a currently available, technology (see Exh. VZ-18). For the reasons already discussed, we agree with Verizon that GR-303 with unbundling capability at the DS0 level, despite future potential, is still hypothetical and not a TELRIC-compliant technology upon which to base UNE rates. We conclude that some level of UDLC should be present in a forward-looking network in order to provide the function of unbundling loops at the DS0 level, which IDLC with GR-303 cannot currently provide, and for other purposes described later.

We disagree with AT&T's argument that the cost of stand-alone loops should be based on IDLC, because IDLC loops can be unbundled at the DS1 level, and, therefore, DS1 loops fall within the FCC's definition of loops. This is not an issue of the definition of loops. The fact remains that most loops that CLECs want to purchase are DS0 level stand-alone loops, not DS1 loops, and no carrier can unbundle IDLC loops at the DS0 level. The costs of stand-alone loops should be based on a technology that actually is capable of providing the function to unbundle loops that CLECs request, rather than on a technology that lacks such a function but is appealing because it reduces costs.

We also disagree with the CLECs' claim that whether the systems to operate GR-303 actually exist is irrelevant when determining the choice of technology for UNE rates. The FCC clearly states that the term "technically feasible" refers to "operational as well as technological concerns." Local Competition Order at ¶ 198. The technology, GR-303 with unbundling capability at DS0 level, has unresolved technical issues as well as operational issues, and the resolution of those impediments is necessary in order for the technology to be deployable in the real world settings (see Exh. VZ-25).

The FCC and the Department analyzed the same document that the CLEC Coalition's witness, Dr. Ankum, submitted in this proceeding to support IDLC unbundling, and have concluded that despite great potential, the unbundling methods described in the documents do not substantially reduce the CLECs' need for unbundled loops. UNE Remand Order at ¶ 217 n.417; Massachusetts Department of Telecommunications and Energy Evaluation of Verizon Massachusetts Section 271 Application, D.T.E. 99-271, at 263-268 (October 16, 2000). The document submitted by Dr. Ankum is dated 1999, and there has been no progress in making the technology deployable on a practical level in a multi-carrier environment (see Exh. CC-3-P, exh. AHA-3, Unbundling Digital Loop Carriers). We do not believe that the FCC requires UNE rates to be based on a technology whose operational feasibility has yet to be resolved. A carrier that is building a network today would use a technology that is deployed today, not a technology that may become deployable in the future.

Regarding the CLECs' claim that Verizon's failure to deploy GR-303 with capability of unbundling loops at the DS0 level is part of Verizon's strategy to impede competition, we do not know whether the fact that GR-303 with unbundling capability at the DS0 level is not deployed on Verizon's network is the consequence or the cause, as the CLECs claim, of unresolved technical issues. However, we note that no other ILECs or facilities-based CLECs have deployed the technology. Facilities-based CLECs are not obligated to provide their competitors with access to their networks, and, thus, have every incentive to deploy the most efficient technology yet, no CLEC has deployed the technology. In addition, Verizon uses the same network to provide service to its wholesale and retail customers. We are not persuaded that Verizon would forego an efficient and currently deployable technology solely in order to maintain high UNE rates, when deployment of that technology could reduce retail costs as well. The CLECs' claim is not credible.

The CLECs suggest that technical impediments related to GR-303 with unbundling capability at DS0 level would be resolved and the technology would be deployed today if Verizon invested in developing the technology, and, therefore, the Department should require Verizon to do so by basing loop rates on this technology (CLEC Coalition Brief at 57-64; WorldCom Reply Brief at 42-47). However, the FCC states that an ILEC's unbundling obligations are limited to existing facilities, and ILECs are not required to construct new facilities to meet CLECs' requirements where the ILEC has not deployed the element for its own use. See UNE Remand Order at ¶ 324; see also Local Competition Order at ¶ 451. We will not require investment in a specific technology in the context of a TELRIC review, nor will we base loop rates on a technology that is not currently deployed by any local exchange carrier.

The CLEC Coalition charges that Verizon intentionally discriminates against CLECs by using IDLC to provide loops to its own retail customers while denying IDLC loops to CLECs (CLEC Coalition Brief at 57-64). Basing unbundled loop rates on IDLC using GR-303 with unbundling capability at the DS0 level does not change the reality that IDLC loops cannot be unbundled at the DS0 level to serve CLECs' customers. Basing loops rates on IDLC using GR-303 with unbundling capability at the DS0 level only creates a discrepancy between the costs Verizon actually expects to incur and the UNE rates, which violates TELRIC principles. UNE rates should be based on the costs ILECs actually expect to incur in a reconstructed network. Until technological issues are resolved and the systems for unbundling IDLC loops at the DS0 level are developed, Verizon should continue to transfer CLECs' customers on IDLC loops to either copper or UDLC. In addition, Verizon's retail customers are served over Verizon's existing network of 80 percent copper/20 fiber with no GR-303 interface, and, thus, they do not benefit from Verizon's proposed network in this proceeding.

Regarding AT&T's proposal that UDLC should be based on Verizon's forecast of the total wholesale loops, we note that AT&T made the proposal for the first time in its reply brief. We reject the proposal for the following reasons. First, AT&T should have made this proposal earlier in the proceeding so that the Department could fully investigate the reasonableness of the proposal. Second, no party objects to Verizon's argument that provisioning unbundled stand-alone loops is not the sole function of UDLC; UDLC is needed for other purposes. Furthermore, the record indicates that UDLC is used in areas that have unknown service requirements and for services that cannot be integrated, such as unbundled loops and non-switched services (see Exh. ATT-VZ 3-5, at 16). The record also indicates that no RT should be fully integrated, and the ratio of IDLC to UDLC is RT-site dependent (see id.; see also Tr. 17, at 3498). Therefore, it would be inappropriate to base the proportion of UDLC solely on wholesale UNE loops demand growth.

Having determined that some level of UDLC is necessary in a forward-looking network, now we turn to whether Verizon's proposed proportion of IDLC/UDLC is reasonable. Verizon applies its proposed copper/fiber thresholds to yield 20 percent copper and 80 percent fiber, and then Verizon increases its current 14 percent IDLC to 25 percent IDLC with GR-303 for purposes of the cost study, based on a two percent annual increase for five years, which in turn determines the proportion of UDLC.[76] Although Verizon states that UDLC is necessary not only to provide unbundled loops but also for other reasons, as described above, Verizon's explanation does not appear to justify a disproportionately high percentage of UDLC compared to IDLC. The only explanation Verizon's witness Mr. Livecchi provided with respect to the UDLC proportion is that the UDLC proportion is determined by default, after applying the copper/fiber threshold and determining the IDLC proportion:

> It's more realistic from the basis that now we have copper/fiber break points, so in the forward-looking network we're going to have some of the network that's fed from copper, and we're saying that is about 20 percent. Then we took a very aggressive look at deploying IDLC, and from where we are today -- and we're saying 25 percent of the new lines would be deployed on IDLC. And so the UDLC number is really the only thing that's left. You have a certain amount of copper that you know you're going to deploy based on your copper/fiber break point and aggressive deployment of IDLC technology, and then what remains is UDLC technology, which is still next-generation digital loop carrier, it's just a different flavor [Tr. 7, at 3367-3368].

Verizon failed to show that its proposed UDLC proportion is reasonable. Given the fact that there is a higher proportion of fiber and IDLC in a forward-looking network than in the existing network, and UDLC is used for purposes other than provisioning unbundled loops, as described above, the UDLC proportion in a forward-looking network may be higher than in the existing network. However, Verizon has not provided any evidence that shows why the "relative proportion" of IDLC to UDLC in a forward-looking network should be any different from the current ratio of IDLC to UDLC. As of year 2001, the ratio of IDLC to UDLC statewide is approximately 2:1 in terms of the number of available lines (see Exh. CC-VZ 2-

76 100% (total feeder loops) - 20% (copper feeder loops) – 25% (IDLC feeder loops) = 55% (UDLC feeder loops).

36, Proprietary Att.).[77] Because IDLC is the least-cost technology, we find it reasonable to assume that the existing IDLC/UDLC ratio will continue into the future. Therefore, we direct Verizon to revise its proposed ratio of IDLC to UDLC to 2:1. Based on our ruling on the copper/fiber thresholds and the resulting copper/fiber proportion in the previous section, we conclude that the copper/IDLC/UDLC proportion should be approximately 41.2/39.2/19.6. Verizon shall revise its proposed copper/IDLC/UDLC proportion, as directed.

Finally, we disagree with AT&T's proposal that the UNE-P rate should be based on 100 percent IDLC. This proposal must be considered within the larger context of our longstanding principle that Verizon's forward-looking network assumptions should be consistent across all UNEs. Basing the UNE-P rate on a different technology assumption (i.e., basing UNE-P on 100 percent IDLC feeder while all other UNE loops are based on blended rates of relative proportions of copper/IDLC/UDLC) violates this principle. The recurring rate of UNE-P is the sum of the prices of its individual elements. Basing UNE-P on 100 percent IDLC would result in different prices for the loop component of UNE-P and UNE-Loop ("UNE-L"), which are identical loops. In addition, whether UNE-P is provisioned over IDLC is determined by whether the customer's location satisfies the technological parameters that dictate IDLC deployment. For all of the above reasons, we conclude that UNE-P prices should be based on blended rates like other UNE loops. Therefore, we reject AT&T's proposal.

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[77] Because the actual figure in Exh. CC-VZ 2-36 is proprietary, we do not quote it.

5. DLC Concentration Ratio

a. Positions of the Parties

i. Verizon

Verizon argues that its proposal of a 3:1 loop/port concentration ratio for lines served by IDLC with a GR-303 interface is reasonable based on its traffic engineering judgment and experience. Verizon argues that the CLEC Coalition's proposal is unreasonable for the following reasons: (1) it is too simplistic and impractical to assume that outside plant can be designed to serve both residential and business customers over the same DLC equipment by taking advantage of differing residential and business traffic patterns; and (2) different traffic patterns are dissolving, and daytime usage continues to climb for both residential and business customers on a going-forward basis due to the "always-on usage" of the Internet, telecommuters, and remote virtual network users (Verizon Brief at 80-81, citing Exh. VZ-38-A, at 34-35; Exh. CC-3-P, at 53; Tr. 9, at 1748-1749).[78] Verizon also states that GR-303 is not a technology that Verizon will deploy in the future, and thus 25 percent of all lines served by GR-303 with a 3:1 concentration ratio already aggressively reduces Verizon's forward-looking costs (Verizon Reply Brief at 107).

ii. CLEC Coalition

The CLEC Coalition proposes a 6:1 loop/port concentration ratio for IDLC lines. The CLEC Coalition argues that Verizon justifies its proposal based on actual traffic patterns and has not provided any empirical data to support its proposal. The CLEC Coalition states that traffic patterns of the customers served by IDLC determine the degree of concentration. The

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[78] Section VII, below, also addresses the impact of traffic patterns on UNE rates.

CLEC Coalition contends that the different calling patterns of business customers (mostly during the day) and residential customers (mostly at night) do not interfere with or crowd out each other, but rather the combination of business customers and residential traffic patterns on the same IDLC will optimize the usage and increase the concentration ratio. The CLEC Coalition also claims that under Verizon's assumption of 100 percent fiber feeder loops in the Metro zone, both business and residential customers are served on DLC and this mix of customers will lead to a higher concentration ratio (CLEC Coalition Brief at 64-67).

b. Analysis and Findings

The CLEC Coalition's proposal of 6:1 for the GR-303 concentration ratio is based on an assumption that residential and business customers will be served on the same IDLC in all cases and that their respective traffic patterns occur at mutually exclusive times of day (Exh. CC-3-P, at 53-59). This is not a credible assumption because residential and business customers are not always located in a manner that allows them to be served by the same IDLC. Verizon persuasively contends that as traffic patterns evolve to accommodate use of, for example, the Internet and telecommuters, the boundaries between residential and business traffic patterns will blur, and that, therefore, opportunities to take advantage of differing residential and business traffic patterns will lessen. We are not persuaded, however, that all such opportunities have disappeared.

Furthermore, Verizon has not provided the current concentration ratio or any engineering guidelines addressing the level of concentration (see Exh. CC-VZ 2-19). Verizon has failed to substantiate its proposed 3:1 concentration ratio. Our review of the record evidence leads us to adjust Verizon's proposed concentration ratio for GR-303 equipment to

4:1 in order to recognize the opportunity for Verizon to take advantage of differing residential and business traffic patterns. We have chosen a 4:1 ratio because Verizon's arguments on this point are more persuasive than the CLEC Coalition's (see Tr. 17, at 3430-3432).

6. DLC Cost Inputs

a. Positions of the Parties

i. Verizon

Verizon contends that it has arguably the largest and most advantageous contract for DLC equipment in the industry, the details of which have been supplied in discovery responses, and that the costs derived from the contract are extensively documented in the work papers. Verizon argues that comparing its fact-based figures with AT&T's speculative inputs reveals a consistent understatement of costs by AT&T (Exh. VZ-57, at 20-21). Verizon argues that since it has a substantial incentive to increase its efficiency under the current regulatory plan, it is reasonable to assume that Verizon would purchase pre-assembled equipment where it is in its economic best interest to do so. Verizon asserts that to the extent the pre-assembled equipment would be expected to reduce costs, Verizon's actual cost information captures those efficiencies. Verizon states that to the extent that DLC material prices decrease, the engineering, furnished and installed factor ("EF&I")[79] should actually increase because the time for installing DLC equipment does not depend on the material costs. Verizon also states that AT&T's unsubstantiated installation hour estimates should be rejected (Verizon Brief at 53-56; Verizon Reply Brief at 128, citing Exh. ATT-29-P, at 30-31).

ii. AT&T

AT&T argues that the difference between Verizon's and AT&T's proposals lies not with material costs, but with Verizon's high EF&I factor. AT&T claims that Verizon's EF&I costs are beyond anything even remotely reasonable and fly in the face of the manufacturer's claims about easy installation. AT&T contends that it is much more efficient to pay a bit more and buy pre-assembled DLC equipment, in which case use of EF&I as a percent of material costs will double count appropriate investments and make pre-assembled equipment more expensive to engineer and install (Exh. ATT-27, at 38-39; Exh. ATT-28, at 13-16; Exh. ATT-29-P, at 30-31).

79 According to Verizon, the EF&I factor translates materials-only investment into an installed investment, including such items as vendor engineering, transportation, warehousing, vendor installation, Verizon installation, and acceptance testing. The sum of the total installed investment for hardwired equipment and plug-in equipment is divided by the sum of material-only investments of the same equipment. This yields the final EF&I factor, which represents the relationship of total cost installed ("TCI") investment to materials investment for equipment. According to Verizon, the EF&I factor is developed on a regional basis (i.e., Verizon-wide) to more accurately account for the many investments are being installed in one state to serve multiple jurisdictions (see Exh. VZ-37, Part G-3).

AT&T suggests that the costs be based on disaggregated material costs, plus an estimate of engineering hours and an estimate of installation hours. AT&T maintains that if one takes Verizon's proposed EF&I dollar costs and translates them into installation times, one can easily see that the costs assumed by Verizon are exorbitant. AT&T recommends that the Department adopt AT&T's installation hours (Exh. ATT-27, at 38-39; Exh. ATT-28, at 13-16; Exh. ATT-29-P, at 30-31).

b. Analysis and Findings

AT&T does not dispute that Verizon's material costs are reasonable, but challenges Verizon's EF&I factor and urges the Department to adopt its proposal. AT&T has not proven that its proposal of engineering and installation hours for DLCs or the material costs are reasonable. In fact, its DLC cost inputs were rejected by the FCC. Although Mr. Mercer, a sponsor of the HAI Model, claims that its DLC inputs were revised based on the FCC's recommendations, it is not clear how and whether the Model's DLC costs inputs were corrected (Tr. 14, at 2711-2712). We cannot credit AT&T's unsupported proposals. The data submitted by Verizon show actual material costs incurred in purchasing and installing DLCs, and, thus, are a reliable source to use as starting point for estimating a forward-looking DLC EF&I factor (see Exh. ATT-VZ 2-27; see also Exh. ATT-VZ 2-28).

Second, the difference between Verizon's and AT&T's proposed EF&I factors does not appear to be simply a function of whether the factor is based on the purchase of pre-assembled equipment. For example, AT&T's proposed EF&I factor is based on the assumption of the $60 per hour labor rate adopted in the FCC's Inputs Order and an assumption of 100 percent above-ground RTs. The labor rate adopted in 1999 by the FCC for universal service fund

("USF") purposes was not a Verizon-specific number and is three years old. Thus it does not represent the actual labor costs Verizon would incur in Massachusetts in a forward-looking environment. In addition, a 100 percent above-ground RT assumption significantly underestimates the site preparation cost element of the EF&I factor, because underground RTs require higher site preparation costs. It is also unclear whether AT&T's EF&I factor includes costs other than those for installation hours, such as transportation and warehousing costs.

Third, if we adopt AT&T's EF&I factor, which is based on the assumption of purchasing 100 percent pre-assembled DLCs, there should be a corresponding increase in Verizon's DLC material costs because, as AT&T states, pre-assembled equipment is more expensive. AT&T does not suggest how to make such an adjustment. Adopting AT&T's EF&I factor while using Verizon's material costs would create a mismatch between the EF&I factor and material costs. Given the fact that the data provided by Verizon show reasonable forward-looking discount rates for material costs of DLC equipment and that the EF&I is based on those declining material costs, we conclude that Verizon's proposed EF&I is a reasonable forward-looking estimation. Therefore, we adopt Verizon's proposal.

7. Dedicated Remote Terminal[80]

a. Positions of the Parties

i. Verizon

Verizon argues that its decision to deploy dedicated remote terminals for buildings with more than 160 lines is reasonable and fully consistent with the design standards that Verizon's engineers rely upon. Verizon states that only a small percentage of RTs are dedicated to buildings and that Verizon typically does not use a dedicated RT to serve another location due to access issues. Verizon explains that it is not easy to access a building containing an RT to repair a line served by that RT but located in a different building. Verizon also states that because property owners pay for power and allocate space for an RT, it is not feasible for Verizon to convince a building owner to let Verizon serve other buildings that the owner does not own from the RT located within the owner's building (Verizon Reply Brief at 125-126, citing Exh. VZ-38-A, at 52, Tr. 17, at 3421-3430).

ii. CLEC Coalition

The CLEC Coalition claims that 100 percent dedicated RTs is not the most cost efficient design (Exh. CC-3, at 63). The CLEC Coalition argues that Verizon's proposal to place dedicated RTs on the premises for buildings with more than 160 lines is unsupported and should be rejected. The CLEC Coalition contends that Verizon fails to follow its own guidelines, which explicitly state that RTs should be deployed in a manner that allows Verizon to serve other areas from that location (CLEC Coalition Brief at 72-73).

[80] A dedicated RT serves a single building rather than multiple locations.

b. Analysis and Findings

The record shows that only 414 RTs out of the total 7,122 RTs are dedicated to individual customer locations, such as high-rise buildings, and the remaining 6,708 RTs serve multiple locations. Thus, contrary to the CLEC Coalition's claim, Verizon does not assume 100 percent dedicated RTs (see RR-DTE-91; RR-DTE-91-S). In addition, the minimum standard of 160 customers for a dedicated RT is based on the fact that the minimum size unit is 224 lines for Litespan equipment (see Exh. VZ-38-A; Tr. 17, at 3421-3430; Verizon Reply Brief at 125-126). We conclude that it is reasonable to assume that high-rise buildings should have dedicated RTs in their locations to take advantage of the high density of lines in high-rise buildings. We also conclude that although Verizon's engineering guidelines recommend using a dedicated RT to serve other locations, Verizon reasonably explains that access and property ownership issues prevent Verizon from using a dedicated RT to serve areas other than the premise on which a dedicated RT is located. Therefore, we approve Verizon's proposal.

C. Fill Factors

1. Introduction

The per-unit cost associated with a particular element must be derived by dividing the total cost associated with the element by fill factors, i.e., a reasonable projection of the actual total usage of the element. Local Competition Order at ¶ 682. Fill factors, the percentage of the total usable capacity that is expected to be used to meet the demand, significantly affect the costs of UNEs, especially loop costs. According to the FCC, the actual (effective) fill factor of cable is the number of pairs needed to meet current demand[81] divided by the number of pairs installed. It varies with the number of customer locations and the available discrete size of cable (breakage).[82] The administrative fill factor (generalized fill factor)[83] is spare capacity to accommodate administrative functions such as testing, repair, and some expected amount of growth. The administrative fill factor is determined by engineering standards and density zone conditions, and is independent of an individual carrier's experience and measured effective fill factors. The effective fill factors may be lower than the optimal values or the administrative fill factor because cables are available only in discrete sizes. Inputs Order at ¶¶ 186, 193-195.

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81 The FCC's definition of current demand includes an amount of excess capacity to accommodate short-term growth. See Inputs Order at ¶ 201.

82 Cable and fiber are available only in certain sizes. For example, assume a neighborhood with 100 households has a current demand of 120 telephones. Dividing the 120-pair demand by an 80 percent administrative fill factor establishes a need for 150 pairs. Cable is not sold, however, in 150-pair units. The company would purchase the smallest cable that is sufficient to provide 150 pairs, which is a 200-pair cable. The fill factor that occurs and is measurable, known as the effective fill, would be the number of pairs needed to meet demand, 120 pairs, divided by the number of pairs installed, 200 pairs, or 60 percent. Inputs Order at ¶ 186 n.386.

83 According to Verizon, administrative spare (sometimes also referred to as critical fill or relief fill) is the minimum amount of spare. The administrative spare is to accommodate customer inward/outward movement, maintenance requirements, and the technical/physical nature of the design of the particular plant and equipment. Forecast uncertainties, defective plant (defective pairs and defective switch originating equipment), random fluctuations in demand, future growth, and other factors are not included in the administrative spare (Exh. ATT-VZ 14-2; Exh. ATT-VZ 14-3).

2. General Issues

a. Positions of Parties

i. Verizon

Verizon states that its proposed fill factors are the product of the continuing application of efficient engineering and reflect the utilization levels that Verizon has observed in the Massachusetts network and expects to observe on a forward-looking basis (Exh. VZ-38-A, at 37-51; Verizon Brief at 81, citing Tr. 9, at 1846). Verizon also states that under the incentives of price cap regulation, Verizon has had and continues to have incentives to reduce spare capacity in its network where doing so is economically efficient. Verizon contends that there is no evidence in this proceeding to suggest that Verizon's fill factors should increase in the forward-looking network. Verizon asserts that its proposed fill factors, which are either higher than or equal to existing levels are conservative, forward-looking cost estimates (Verizon Brief at 82-86). Verizon contends that, if anything, the competitive environment assumed under TELRIC should decrease average utilization as a result of increased fluctuations in demand and customer churn in the network (id. at 81-84).

ii. AT&T

AT&T argues that a TELRIC-compliant model must strike a balance between supporting sufficient investment to allow for growth while not imposing costs upon UNE purchasers for network equipment that will never be used. AT&T contends that Verizon bases its proposed UNE rates on unreasonably low fill factors or assumptions regarding effective utilization of OSP. AT&T argues that Verizon's proposed fill factors are considerably lower than those adopted in other jurisdictions and by the FCC. AT&T claims that Verizon should not be permitted to inflate artificially the UNE rates charged to its competitors by using unreasonably low fill factors (AT&T Brief at 126-127).

iii. WorldCom

WorldCom states that Verizon's studies reflect the fill factors that Verizon has observed and, thus, reflect inherent inefficiencies of its embedded network rather than the efficiencies of a new network. WorldCom argues that for this reason alone, Verizon's loop-related fill factors ought to be adjusted upward (WorldCom Reply Brief at 34).

b. Analysis and Findings

As a general matter, we note four points. First, the forward-looking practice of a carrier does not necessarily equate to the historical practice of the carrier. Also, the practice of a carrier does not necessarily change if the relevant cost drivers remain the same in the future. In the Consolidated Arbitrations, the Department stated that although the network may be viewed as dropped in place, it will presumably exist beyond the moment it is dropped in place, and there is no reason to believe that the same set of drivers that exist today when Verizon plans its own network would not exist in a situation where it is the firm building unbundled network elements under the TELRIC framework. See Consolidated Arbitrations Phase 4 Order at 32. Second, generally, the CLECs' proposals are in line with what Verizon considers as relief levels (maximum achievable fills) in its OSP engineering guidelines (Exh. ATT-VZ 3-5-P). Because the CLECs did not argue that Verizon's OSP guidelines violate engineering standards, we will use those guidelines to determine forward-looking fill factors. Third, as we mentioned in Section III (Economic Issues), above, we give little weight to the parties' proposals supported solely by decisions made in other jurisdictions unless the underlying rationale is persuasive and the supporting evidence is applicable in Massachusetts. Fourth, we note that Verizon's proposed fill factors are either the existing fill factors or ten percent higher than its existing fill factors.

Price caps give companies an incentive to improve productivity by allowing those that outperform the productivity offset to keep the resulting profits and, thus, encourage investment in more productive equipment. From 1995 to 2001, Verizon operated under a price cap form of regulation in Massachusetts. Therefore, Verizon is correct in stating that it has an incentive to economically utilize its network, and, thus, the current fill factors reflect the practice of utilizing its network efficiently under a price cap regime. However, under a price cap regime, prices reflect only a regulated entity's productivity. Under the competitive market that we assume under TELRIC principles, the carrier that is most efficient at any single point in time sets the price. Carriers that fail to emulate the most efficient carrier's productivity cannot survive, or at least do not prosper, and, accordingly, carriers are under constant pressure to maximize efficiency. Therefore, even though some aspects of Verizon's engineering guidelines that drive fill factors may be as applicable in a forward-looking environment as they were five years ago when we first set UNE rates, a new cost driver (i.e., increasing competition in the markets that TELRIC envisions) warrants some adjustment of Verizon's proposed fill factors, which were achieved under a price cap regime.

Although competition increases uncertainty, we do not agree with Verizon's argument that because of increased uncertainty it should use lower fill factors. In cases such as distribution cables where the capacity cannot be easily adjusted, Verizon's reasoning may be more persuasive. However, with the exception of distribution cables, as Verizon's own engineering guidelines (Exh. ATT-VZ 3-5-P) show, facilities have varying degrees of flexibility in capacity adjustment. Furthermore, increased competition gives a carrier more incentive to raise its efficiency by taking full advantage of the flexibility of capacity adjustment. Such flexibility enables a carrier to absorb uncertainty more efficiently. Moreover, we do not believe that it would be appropriate to protect Verizon against the volatility of the competitive local market by allowing it to take into account all possible eventualities in its UNE rates. Such regulatory safeguards would diminish Verizon's incentive to make prudent investment decisions.

On the other hand, the CLECs' proposed fill factors are in many cases the maximum levels that a carrier can achieve on a perfectly sized network to meet known current demand. We find it unrealistic to assume, as the CLECs claim, that a carrier, even under the most efficient technology assumptions, could operate most of its facilities at near optimal levels throughout its entire network. Even the most efficient carrier would neither have perfect knowledge of the market in which it operates nor be immune to uncertainty or unanticipated changes. A forward-looking network should be sized to take into account to some extent the uncertainty that carriers face in the real world. The FCC also has rejected the notion that higher fill factors are appropriate simply because effective fill factors are lower than optimal values. See Inputs Order at ¶¶ 199-204.

As we state in Section III, although Verizon has the burden of proof, where a Verizon opponent has presented an alternative proposal it asserts to be TELRIC-compliant, that party has the burden of proof with regard to its own affirmative case. The CLECs have not provided sufficient evidence or data to show the reasonableness of their proposed fill factors.

Given the lack of controverting evidence and the better evidentiary foundation for Verizon's proposals, we will use Verizon's proposals for fill factors as a "starting point" and modify Verizon's proposals as described below. As we do not have data or analysis that show to what extent competition would affect different fill factors, the determination of the amount of adjustment requires a degree of predictive judgment. In determining forward-looking fill factors, we will consider the flexibility of the relevant facility, i.e., the interval at which capacity is added, and the maximum fill factor. We now turn to facility-specific fill factors.

3. Distribution Fill Factor[84]

a. Positions of the Parties

i. Verizon

Verizon computes its proposed distribution fill factor as follows (see Exh. VZ-38-P, at 78-83):

Line	Description	Source	Value
1.	1.2 lines per living unit/2.0 lines per living unit (current demand/design criteria)	Verizon	60.0%
2.	Growth adjustment of potential units (zoned but unbuilt units)	Verizon	10.0%
3.	Churn (vacancy adjustment)	Verizon	5.0%
4.	Loss to competitors	Verizon	10.0%
5.	Subtotal: estimate of zoned living units that will actually utilize Verizon's network	1 - (L.2 + L.3 + L.4)	75.0%
6.	Fill	L.1 * L.5	45.0%
7.	Breakage	Verizon	90.0%
8.	Effective fill	L.6 * L.7	40.5%

[84] In Section VI.C.1 (Fill Factors), we define different fill factors. Hereafter, we simply use "fill factor" to mean "effective fill factor."

Verizon argues that its proposed 40 percent fill factor reflects its efforts to balance the competing concerns of (1) maintaining spare capacity for a variety of reasons, such as fluctuation of demand, growth, churn, and breakage; and (2) making the network more efficient by reducing spare capacity where it is economically efficient to do so. Verizon contends that if anything, the competitive environment assumed under TELRIC should decrease average utilization, as a result of increased fluctuations in demand and customer churn in the network (Verizon Brief at 81-84; RR-DTE-83).

Verizon claims that the CLECs have not produced evidence that any network could be operated efficiently with fill factors as high as AT&T and WorldCom's proposed 64 percent and CLEC Coalition's proposed 75 percent, and operating the network at those levels would result in substantial efficiency loss and service degradation (Verizon Brief at 84-86). Verizon notes that even the HAI sponsors' proposed effective fill factor of 49 percent is much lower than those proposed by the CLECs (id.). Regarding the CLECs' claim that today's customers should not pay for spare capacity that will be used by future customers, Verizon points out that: (1) customers who obtain service pay only the incremental costs of providing that unit of capacity in the facility during the period in which the customer receives service, not the full costs of the underlying facility, as CLECs claim; and (2) contrary to CLECs' assumption that the primary purpose of spare capacity is to serve future growth, spare capacity is needed to serve current operational needs, to meet current and unpredictable demand spikes, and for current administrative purposes. Verizon also states that spare capacity is never used up by future customers and remains at the same level by adding new capacity, and thus future customers shoulder the cost of maintaining an efficient level of spare capacity during the time they receive services (id.).

With respect to assigning two pairs per unit, Verizon states that sufficient distribution cable must be provided at initial construction to accommodate potential peak demand, which is created not by long-term growth but by statistical fluctuations in demand, i.e., the network design must take into account the uncertainties as to when and where demand will change (id. at 87-89). Verizon argues that there is no basis for assuming that the neighborhood in which customers have rarely ordered two lines will not suddenly "sprout" teenagers needing second lines for surfing the Internet (id. at 92). Verizon also states that AT&T's challenge of two pairs per unit is based on a mischaracterization of Verizon's testimony. Verizon asserts that the flexibility of moving lines between neighbors is extremely circumscribed in practice (Verizon Reply Brief at 113, citing Tr. 17, at 3336-3337).

Regarding its proposed adjustment for potential living units, Verizon explains that outside plant engineers must often construct new distribution cable in areas long before potential living units are built, and, thus, the utilization level is zero after the initial installation for a particular cable route (id. at 117). Concerning adjustment for churn, Verizon claims that at any single point in time, some existing units are vacant and that such volatility and uncertainty of the existing units should be taken into account in the distribution fill factor (Verizon Brief at 89-90). Additionally, Verizon contends that the distribution fill factor should be adjusted by ten percent breakage because cable comes in discrete sizes (id.). Lastly, Verizon assumes that in a forward-looking environment approximately ten percent of potential customers do not utilize Verizon's distribution facilities because they do not have any wireline phone service or they take service from a competitor (id.). Verizon argues that contrary to the CLEC Coalition's claim, a ten percent loss to competitors already takes into account the fact that many competitors' strategies do not reduce utilization of Verizon's loop network (Verizon Reply Brief at 117).

Verizon opposes the CLECs' recommendation to adjust costs based on three percent annual growth for ten years, because the CLECs erroneously ignore additional investments needed to construct new facilities in order to accommodate growth. Verizon also argues that the CLECs' proposal ignores the fact that the distribution fill factor is stable over time, and the proposal of 64 percent, combined with an adjustment of three percent annual growth for ten years, yields a "ridiculously" high distribution fill factor of almost 100 percent (Verizon Brief at 110, citing Exh. ATT-23, at 19; Tr. 17, at 3494-3495).

ii. AT&T

AT&T computes its proposed distribution fill factor as follows (Exh. ATT-23, at 27):

Line	**Description**	**Source**	**Value**
1.	1.6 lines per living unit design criteria	1/1.6	62.5%
2.	1.2 lines per living unit	Verizon	120%
3.	Starting fill	L.1 * L.2	75%
4.	Churn (vacancy adjustment)	Verizon	95%
5.	Fill	L.3 * L.4	71.25%
6.	Breakage	Verizon	90%
7.	Effective fill	L.5 * L.6	64.125%

AT&T argues that Verizon's assumption of two pairs per living unit cannot be justified for the following reasons: (1) Verizon acknowledges the existing demand for second lines, i.e., 20 percent per living unit, which would remain relatively stable over the next five years; and (2) even if Verizon tried to justify two pairs per living unit with the argument that the termination of distribution pairs cannot be moved and one does not know in advance which locations might seek a second line, further cross-examination during the hearings confirmed that there is considerable flexibility to move lines around between neighbors. AT&T argues that generally accepted engineering practices permit outside plant designs with as few as 1.6 lines per living units (AT&T Brief at 131-132; AT&T Reply Brief at 89).

AT&T also argues that Verizon's proposed reduction for zoned but unbuilt units should be disallowed. AT&T notes that Verizon allocates pairs to provide for the long-term demand that could occur in an area if all the zoned land is developed, but then states that the ten percent reduction has nothing to do with vacant land but instead reflects parcels that have not been developed to the maximum density permitted by zoning. AT&T asserts that the data Verizon provided to support a ten percent reduction for zoned but unbuilt units only show truly vacant land and are in contrast with the other categories of zoned units. AT&T contends that Verizon could not provide any data to support its claim regarding the percentage of land in Massachusetts that is neither vacant nor built to maximum allowable density. Additionally, AT&T contends that Verizon reduces its fill factor to account for undeveloped parcels at the outset of the analysis but fails to make any subsequent adjustment for the parcels that would eventually be developed, occupied and generating revenue (AT&T Brief at 132-133).

AT&T claims that Verizon's ten percent downward adjustment for loss to competitors is not warranted for the following reasons: (1) the ten percent figure is based on Verizon's proposal in New York, in which the state of local competition is very different from that in Massachusetts; (2) Verizon's current market penetration rate is 97 percent, and the remaining three percent is not a result of people switching to competitors, but rather a result of the fact that people simply choose not to have a wireline phone; and (3) Verizon fails to account for the possibility that facilities that become idle due to customer migration will become available to serve new customers and generate new revenue (id. at 134).

AT&T concludes that once Verizon's unreasonable adjustments to the effective fill factor are removed, one can arrive at a fill factor of 64.1 percent, as shown by AT&T and strongly endorsed by the HAI 5.2a-MA sponsor, Mr. Donovan. AT&T asserts that a 64.1 percent fill factor is supported by Verizon's own data showing the ratio of the number of working lines to the total available lines to be 60 percent (id. at 131, 135).

AT&T argues that the increased revenue from demand growth must be balanced against the increased investment necessary to service that demand, i.e., future customers of new plant investment should share the burden of that investment. AT&T and WorldCom suggest that three percent annual demand growth be accounted for in determining per unit costs (id. at 139-140).

iii. WorldCom

WorldCom supports AT&T's position (WorldCom Brief at 48-58). In support of the assumption of 1.6 pairs per unit, WorldCom argues that under TELRIC principles, a new entrant knows the actual level of demand and designs its outside plant accordingly, but Verizon fails to do so. WorldCom contends that Verizon follows its existing network design criteria of assigning two pairs per unit despite the available information that might warrant a new entrant to conclude that something less than two pairs per living unit was actually necessary. WorldCom claims that the increase of second line demand would be much less likely to occur in the future due to the ubiquitous availability of plain old telephone service ("POTS") and advanced services over single lines and other alternative modes of communications, such as wireless phones and pagers (WorldCom Reply Brief at 34-39). WorldCom also supports AT&T's proposal that Verizon's fill factor should be adjusted by demand that will materialize in the future. WorldCom points out the inconsistency between the denominator (demand) and the numerator (investment), stating that Verizon has derived UNE costs by dividing the cost of current and future capacity by existing demand. WorldCom argues that if Verizon sizes the capacity for its network to serve ultimate demand, then it should divide the total investment to meet ultimate demand by the existing demand plus the additional demand that will materialize in the future (id. at 47-50, citing Inputs Order at ¶ 58).

iv. CLEC Coalition

The CLEC Coalition recommends a distribution fill factor of 75 percent. The CLEC Coalition contends that Verizon's development of its distribution fill factor is flawed for several reasons. First, the CLEC Coalition argues that spare capacity does not have to be set aside separately for different reasons, e.g., spare cables caused by vacant units can be used for another nearby unit where a deficient pair awaits a repair job. Second, the CLEC Coalition argues that adjustment for future growth is unjustified for the following reasons: (1) CLECs should not be required to pay for spare for growth that will be used to serve Verizon's future customers, and future customers should pay for their own facilities; (2) Verizon's own data shows that there will be no growth, and, thus, there should be no spare for growth in a forward-looking network; and (3) the adjustment of the fill factor for undeveloped parcels violates the FCC's prohibition against calculating fill factors to serve ultimate demand. Third, the CLEC Coalition contends that Verizon ignores the fact that the CLECs presumably serve the local market primarily with unbundled loops provided by Verizon, and, thus, the migration of customers to the CLECs does not reduce the utilization of Verizon's network. The CLEC Coalition adds that Verizon failed to demonstrate the percentage of customers that would be lost to facilities-based CLECs. Fourth, the CLEC Coalition claims that customers gained by newly developed parcels and customers lost to competition will ultimately offset each other to some degree, i.e., as customers are lost to competitors, facilities will become available to serve new customers on newly built parcels (Exh. CC-3, at 32-34; Exh. CC-VZ 2-48; Exh. CC-VZ 2-49; CLEC Coalition Brief at 42-48).

b. Analysis and Findings

We disagree with AT&T's argument that we should adopt its proposed 64.1 percent fill factor because Verizon's own data (ratio of working lines to total available lines) support the proposal. Available lines are only a subset of total lines in inventory, or total lines installed. We should determine a distribution fill factor based on a ratio of working lines to total lines installed rather than total available lines. In addition, we note that the HAI 5.2a-MA's proposed fill factor, from an engineering perspective, is more comparable to Verizon's proposed fill factor. The HAI 5.2a-MA uses an effective fill factor of 48.4 percent,[85] and further corroborates the reasonableness of the fill factor we direct below.

Turning generally to Verizon's proposed adjustments for the distribution fill factor, we do not believe that the fact that Verizon's existing 40 percent fill factor has been stable demonstrates its reasonableness for a forward-looking cost study per se. The stability corresponds to a time period that does not necessarily correspond with the future industry.

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[85] The HAI 5.2a-MA sponsors proposed a 48.4 percent effective fill factor, but later in the case endorse the 64.1 percent fill factor proposed by AT&T's witness, Mr. Baranowski (see Exh. ATT-28, at 6).

With its proposed distribution fill factor, Verizon seeks comprehensive protection from all possible sources of uncertainty in serving the local exchange market. Adjustments for churn and breakage (cable modularity) are appropriate and undisputed, and are taken into account in both the LCAM and the HAI 5.2a-MA. However, Verizon also seeks adjustments for the possible development of vacant lots, possible loss to competitors, and the continuing practice of deploying two lines per unit. We do not interpret the purpose of TELRIC to insulate Verizon from all uncertainty but rather to incorporate network assumptions based on reasonable adjustments to allow for cost-effective network growth. As the CLECs do not contest Verizon's proposed adjustments for breakage (ten percent) and churn (five percent), we will focus our analysis on the disputed adjustments: (1) the number of lines per unit; (2) adjustment for potential units; and (3) adjustment for loss to competitors.

Regarding two lines per unit, we find that Verizon's proposal is reasonable. Verizon's engineering guidelines show that it assigns a minimum of two lines per unit (Exh. ATT-VZ 3-5-P, Att. at 36). Although the HAI 5.2a-MA sponsors show how they calculated 1.6 lines per unit, they do not provide any engineering documentation to support their claim that some units can be assigned only one line. In addition, even the HAI 5.2a-MA assigns two pairs per residential unit, a fact revealed in the HAI 5.2a-MA's sponsors' own testimony and from the Department's cross-examination about sizing of the serving area interface ("SAI")[86] (see Exh. ATT-29-P, at 19; see also Tr. 15, at 2971-2985).

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[86] The SAI is the interface between the distribution and feeder cable. Feeder cables terminate on one or more SAIs in each serving area, where they are cross-connected to copper distribution cables. The distribution fill factor is measured at the SAI.

We disagree with AT&T's characterization of Verizon's statement that there is a considerable degree of flexibility in moving pairs around. Contrary to AT&T's claim, Verizon asserts that there is only limited flexibility to assign spare pairs to neighbor locations (see Tr. 17, at 3336-3337). The CLEC Coalition's argument concerning the overlapping use of spare facilities is also based on the assumption that there is high degree of flexibility to move pairs around wherever there is a need. We find it unrealistic to assume that a vacancy and a repair job will occur in locations close enough to each other to permit pairs to be moved. In addition, pairs assigned to a vacant lot may be needed if and when the lot is reoccupied, and, thus, may not be freely reassigned to a neighboring location.

With respect to a growth adjustment for potential units, although the FCC expresses concern about the highly speculative nature of estimating ultimate demand or potential units (i.e., zoned but unbuilt units), the FCC does not rule out the use of ultimate demand. In addition, the record shows that potential units are taken into account when deploying loop plant (Exh. ATT-3-5-P, at 36). However, as the CLECs correctly point out, if we assume a network built to accommodate ultimate demand, there should be consistency between the numerator and the denominator of the fill factor, i.e., if the investment (the numerator) included ultimate units, ultimate demand should be used in the denominator.

We find reasonable Verizon's argument that: (1) it is prohibitively expensive to supplement distribution loop facilities; and (2) it will deploy loops before buildings are actually built and occupied, and, thus, the fill factor should be adjusted to account for potential units. In addition, as we are modeling a forward-looking network, it is reasonable to include forward-looking costs to build the facilities for vacant lots that would be zoned, developed, and built. However, Verizon has failed to prove that it has already deployed loop facilities to ten percent of all the vacant parcels. The data Verizon provided only show a percentage of vacant land. They do not show whether Verizon has actually deployed loop plant to all ten percent of the vacant land (see Exh. DTE-VZ 1-6, Att. 1). In addition, Verizon has not clearly indicated at what point during the zoning and building process it actually deploys loop facilities to newly developed lots (see Tr. 17, at 3342-3343). Furthermore, Verizon has not shown that at any single point in time, there are ten percent zoned but unbuilt units. In other words, Verizon provides no evidence to show that vacant land is zoned at the same rate that units are built and occupied on zoned land (see Tr. 17, at 3334-3338). In addition, Verizon focuses only on the cost side of future growth. We agree with the CLECs that demand growth should be taken into account, as some vacant land will eventually be zoned, built, and occupied. Because potential units will eventually be developed and occupied, and because Verizon has failed to prove the magnitude of its proposed ten percent adjustment for potential units, we direct Verizon to reduce the adjustment factor for potential units to three percent.[87]

Because of the uncertain demand for second lines for local service, Verizon must submit in the next TELRIC investigation the following information: (1) annual data regarding actual demand for second lines between 2000 and the date of its next TELRIC filing, so that the Department can assess the continuing reasonableness of its design criterion of two lines per unit and its assumption of actual demand of 1.2 lines per unit; and (2) a discussion of how its engineering guidelines have evolved, if at all, to account for customers' use of alternative

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87 See, e.g., Sprint Communications Co. v. FCC, 274 F.3d 549 (D.C. Cir. 2001) (upholding FCC approval of state commission's use of discretion in setting TELRIC-based NRCs).

technologies to supplement their primary lines. A competitive new entrant would continuously revisit its engineering practices in light of changing consumer demands and technological developments, and, thus, it is important that Verizon provide evidence of similar efforts.

With respect to adjustment for loss to competitors, Verizon provided an AT&T press release to substantiate its proposed ten percent adjustment for loss to competitors (Exh. DTE-VZ 1-6, Att. 2). We do not find this document sufficient to support Verizon's proposal. As many of Verizon's competitors would still use Verizon's loop facilities and generate revenue for Verizon, only competitive loss not associated with Verizon's loop facilities should be taken into account. Verizon has failed to make an affirmative showing that the ten percent estimate is a loss to facilities-based competitors or services that are not using Verizon's network. We direct Verizon to reduce the adjustment for loss to competitors to three percent, i.e., approximately one-third of Verizon's proposed adjustment, in order to account for the fact that a significant level of competition occurs using Verizon's loop facilities. We confirm that the incorporation of the aforementioned changes in adjustment factors yields a 48 percent[88] distribution fill factor and direct Verizon to revise its proposed distribution fill factor accordingly.

88 The calculation is as follows:

$$[(1.2/2) \times 100\%] \times [100\% - (3\% + 5\% + 3\%)] \times 90\% = 48.06\%.$$

4. Copper Feeder and RT Common Equipment Fill Factors

a. Positions of the Parties

i. Verizon

Verizon states that the current 55.2 percent fill factor is the appropriate forward-looking copper feeder fill factor because it represents: (1) the continued application of Verizon's prudent engineering guidelines, which recognize that feeder cable should be designed to be relieved every three to five years; (2) the level of volatility in demand throughout the feeder plant; (3) the fact that existing cables cannot be removed and relocated as demand changes; and (4) the fact that the efficient design and engineering standards applicable to the feeder network will not change. Verizon contends that CLECs' recommendations are inconsistent with Verizon's engineering guidelines that require feeder to be relieved when it achieves a 90 percent level, and ignore the fact that on average Verizon cannot operate its feeder in the 80-85 percent range (Verizon Brief at 93, citing Exh. VZ-38A, at 45-47, 83-84). Verizon argues that contrary to the CLECs' view, the trend in the relative quantity of copper versus fiber has no impact on the appropriate forward-looking fill that should be assumed with respect to the copper feeder that does exist (Verizon Reply Brief at 119).

ii. AT&T/WorldCom

AT&T proposes an 80 percent fill factor for copper feeder. AT&T argues that Verizon's proposal is based on historic fill levels in its embedded network and thus is too low for a TELRIC least-cost network configuration. AT&T contends that Verizon's own engineering guidelines establish that copper feeder is designed to be relieved every three to five years, and with the assumption of aggressive three percent annual growth, far too much copper feeder cable is left unused in a network operating at a 55.2 percent level. AT&T argues that an 80 percent fill factor at three percent annual growth still results in a fill factor below Verizon's supposed 90 percent ceiling. AT&T contends that given the increasing deployment of fiber feeder, Verizon's proposal to maintain the current fill will result in further stranded investment (AT&T Brief at 135-137; AT&T Reply Brief at 91). WorldCom supports AT&T's position (WorldCom Brief at 53-54).

iii. CLEC Coalition

The CLEC Coalition proposes an 85 percent fill based on three percent annual growth at a three-to-five-year relief interval and claims that the 85 percent assumption allows sufficient capacity for growth, churn, and breakage. The CLEC Coalition claims that Verizon's embedded fill reflects an inefficient use of resources and, therefore, should not be used as a benchmark in a TELRIC setting. The CLEC Coalition contends that the increasing deployment of fiber feeder and virtually zero growth result in excess spare capacity for copper feeder. The CLEC Coalition argues that once a copper feeder reaches its maximum fill, it will most likely be replaced by fiber rather than be reinforced, and, therefore, copper feeder fills should be considerably closer to a 90 percent level (CLEC Coalition Brief at 48-51, citing Exh. VZ-36, at 79; Exh. VZ-38, at 27-29, 45).

b. Analysis and Findings

The CLECs' proposal allows spare capacity only for growth and none for maintenance, repair, breakage, and uncertainty. If we adopt the CLEC Coalition's proposal, in the fifth year, the copper feeder fill factor would reach 92 to 97 percent, a level that is higher than the maximum 90 percent allowed in Verizon's engineering guidelines. If the need for repair and maintenance arose during the five years, the fill could exceed 100 percent. Spare capacity is needed not only for demand growth but also for administrative spare, breakage, and forecast uncertainties, factors that the CLECs do not account for in their proposal. Although AT&T proposes 80 percent fill factor, its proposed HAI Model yields an effective fill factor of 73 percent (see Tr. 15, at 3006).

On the other hand, Verizon's proposed copper feeder fill factor leaves an unnecessarily high level of capacity unused. Taking into account the relief fill intervals (three to five years), the administrative fill[89] (90 percent), and the remaining adjustment factors such as breakage, churn, and growth, we find a 69 percent fill factor sufficient to provide Verizon ample room to absorb uncertainty. Because Verizon indicates that the RT electronics (common equipment) fill factor is assumed to be the same as the copper feeder fill factor, we direct Verizon to adjust the RT electronics fill factor to 69 percent as well (see Exh. ATT-VZ 14-44).

5. Fiber Feeder Fill Factor

a. Positions of the Parties

i. Verizon

Verizon contends that the current 60 percent factor accurately reflects the forward-looking fiber feeder fill level because it accounts for sufficient spare capacity to address unforeseen changes in demand and customer volatility, rearrangement, maintenance, and outage, as well as breakage. With respect to breakage, Verizon maintains that most fiber cables are manufactured in groups of twelve ribbons, and it is easier and more cost-effective to

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89 Maximum fill is synonymous with relief fill or administrative fill (see Exh. ATT-VZ 15-8). The effective fill is the final product after adjustment by several elements.

allocate, dedicate, and work with full ribbons (even leaving eight spare strands) than to divide the ribbon into individual strands and re-splice them individually to use at other sites (Verizon Brief at 94, citing Exh. VZ-38-A, at 49-51).

Verizon argues that the CLECs' proposed 100 percent fill factor fails to account for these two primary drivers and ignores very real operational issues Verizon confronts in connection with the provision of actual service. Verizon claims that operating a network with 100 percent fill factor would mean that: (1) Verizon could not respond to new demand without initiating construction; (2) any orders for such service would have to be held; and (3) there would be no allowance for breakage, defects, and maintenance (Verizon Brief at 95, citing Exh. VZ-38-A, at 50). Verizon contends that AT&T falsely claims that Dr. Ankum testified that changes in electronics can expand the capacity of fiber feeder (Verizon Reply Brief at 119, citing AT&T Brief at 138). Verizon also contends that redundancy of fibers should not be considered spare, because it is in place so that part of the network can be switched automatically to the redundant system in case of malfunction (Verizon Reply Brief at 120).

ii. AT&T/WorldCom/CLEC Coalition

AT&T, WorldCom, and the CLEC Coalition assert that the FCC has determined that a 100 percent fill factor for fiber is an appropriate measure of utilization in a forward-looking network given fiber's inherent redundancy and flexibility. The CLECs claim that because Verizon's 60 percent fill factor is inclusive of redundancy, Verizon's effective fill is 30 percent. The CLECs assert that a 100 percent fiber fill factor actually results in a 50 percent effective fill, given the extra "transmit and receive" fibers that are run from every fiber to multiplexers. The CLECs maintain that the capacity of fiber feeder is not limited by the number of fiber strands in place because a given number of fibers can have greater capacity with different electronics, and methods such as wave division multiplexing for expanding the capacity of in-place fiber feeder cable continue to be developed (CLEC Coalition Brief at 51-52; WorldCom Brief at 53-54; AT&T Brief at 137-138, citing Tr. 7, at 1393). In addition, WorldCom contends that Verizon fails to take into account that "excess fibers" can be provisioned to provide a DSL and other high speed services to CLECs and to Verizon's end-user customers, or as dark fiber, thereby increasing the fill factor (WorldCom Reply Brief at 39).

b. Analysis and Findings

Verizon's proposed fiber feeder fill factor of 60 percent is ten percentage points higher than its 49.8 percent fill factor for year 2000 (see Exh. ATT-VZ 14-25). We agree with Verizon that a 100 percent fill factor would require new construction for new orders and provide no allowance for breakage, defects, and maintenance. However, we note that the fiber feeder fill factor already includes inherent spare capacity, because two redundant pairs are assigned to every two fibers for emergency use. Therefore, we conclude that fiber feeder can achieve a higher fill than copper feeder, thereby requiring less spare capacity than copper feeder. Accordingly, we direct Verizon to revise its fiber feeder fill factor to 75 percent.

6. Duct Fill Factor

a. Positions of the Parties

i. Verizon

Verizon proposes a 44 percent duct fill factor.[90] Verizon argues that it is far more efficient and appropriate to install sufficient duct capacity to accommodate growth needs for the life of the plant for the following reasons: (1) given the relatively low incremental cost of installing an additional duct, it is less costly to install spare capacity during initial installations rather than to repeatedly re-dig trenches to install additional duct capacity every few years; (2) municipalities typically discourage repeated excavations and require Verizon to reserve a duct for municipal use; and (3) spare ducts are needed in cases, such as a duct failure or flood (Verizon Brief at 95, citing Exh. VZ-38-A at 50-51). Verizon states that a separate utilization factor should be applied for a spare inner duct within an individual working duct, because a spare inner duct has functions distinct from spare ducts, such as to support cable additions or for emergency maintenance activities. With respect to the CLECs' criticisms of Verizon's proposal, Verizon contends that neither the presence of spare cable capacity nor upgrading fiber electronics is a substitute for spare conduit, because spare cable capacity in a failed or flooded duct cannot be used to restore service. Verizon argues that the goal is to have a second duct available in which a backup cable can be installed and placed into service (id. at 96, citing Exh. VZ-38-A at 51).

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[90] Verizon assumes that each conduit carries three ducts, two of which are used and one that is spare, thereby establishing a 66.7 percent fill factor. Verizon then applies 66.7 percent to 66.7 percent (spare inner duct in a working duct). The resulting duct fill factor is, thus, 66.7 x 66.7 = 44.4 percent (see Exh. ATT-VZ 16-3).

ii. AT&T

AT&T argues that the duct fill factor should be 100 percent. AT&T argues that Verizon's proposal is inflated for the following reasons. First, AT&T contends that Verizon assumes that an entire spare conduit pipe between manholes is needed to house future facilities. AT&T argues that this assumption ignores the standard industry practice of reserving a spare maintenance duct within each conduit, which is always available for reserve purposes. Second, AT&T claims that Verizon assumes a spare inner duct for every two in service, in order to facilitate the placement of fiber cable. AT&T maintains that because a typical duct contains three to four inner ducts each capable of handling a fiber sheath, adequate capacity is created with the allocation of one spare inner duct for an entire conduit section. Lastly, AT&T asserts that because the distribution and feeder fill factors are already designed to accommodate additional demand, applying a duct utilization fill factor on top of the cable factor results in an unnecessary inflation of costs (AT&T Brief at 138-139).

iii. CLEC Coalition

The CLEC Coalition argues that the NYPSC rejected a second fill adjustment because the adjustment overstated costs through overlapping fill factors that provided more excess capacity than needed. The CLEC Coalition contends that because New York and Massachusetts have similar proportions of urban and rural areas, the Department should adopt the 60 percent fill factor as approved by the NYPSC (CLEC Coalition Brief at 55-56).

b. Analysis and Findings

First, we note that AT&T's proposed 100 percent duct fill factor contradicts the guidelines for the duct fill factor that AT&T uses in its own model. The HAI 5.2a-MA uses one spare maintenance duct as a default. Moreover, the HAI 5.2a-MA provides an additional maintenance duct, if there is also a fiber feeder cable along with a copper cable in the run, which is analogous to a spare inner duct adjustment (see Exh. ATT- 25, exh. RAM-3, sections 2.4.4, 3.1.5). AT&T should not propose an input that it does not even use in its proposed forward-looking model. Therefore, we reject AT&T's proposed 100 percent duct fill factor.

On the other hand, although we find reasonable Verizon's argument that a spare duct is necessary for emergency use, Verizon has failed to demonstrate that its proposed duct fill factor complies with engineering guidelines and also has not clearly shown that spare inner ducts and spare ducts have mutually exclusive functions, and, thus, need separate adjustments. In addition, Verizon states that the inner duct is only placed in ducts that will have a fiber cable in them (Tr. 17, at 3441). However, we do not believe that "every duct" has a fiber cable in it, and thus an inner duct adjustment is necessary only for a portion of the ducts that have fiber cables in them. For the reasons discussed, we will allow Verizon only half of its proposed spare inner duct adjustment. We conclude that the spare inner duct adjustment should be increased to 83 percent. Based on our ruling, we direct Verizon to revise its proposed duct fill factor to 55.4 percent.[91]

[91] The calculation is as follows: 66.7% (spare duct adjustment) x 83% (spare inner duct adjustment) = 55.4%.

7. Remote Terminal Channel Units Fill Factor

a. Positions of the Parties

i. Verizon

Based on its experience and operational reality, Verizon expects to achieve 80 percent utilization for RT channel units in a forward-looking network. Verizon contends that the 90 percent utilization proposed by the CLECs is unreasonable, because even though individual RTs can operate at 90 percent before capacity must be added, this cannot be the average condition for all RTs throughout the entire network. Verizon claims that the entire plant cannot be operated at the relief point, and if 90 percent is used as the average condition, many RTs would have to operate above the relief maximum of 90 percent, thereby resulting in higher costs and poor service (Verizon Brief at 96, citing Exh. VZ-36, at 85, Exh. VZ-38-A, at 48, Tr. 9, at 1751-1752).

ii. AT&T/WorldCom

AT&T states that Verizon's proposal is inflated given the generally accepted standard in the industry that RT plug-ins can be added at six-month intervals. AT&T argues that even assuming an aggressive annual growth rate of three percent, RT channel units would experience only 1.5 percent growth between six-month relief periods. AT&T maintains that a 90 percent fill factor is more reasonable (AT&T Brief at 138). WorldCom supports AT&T's proposal (WorldCom Brief at 54-55; WorldCom Reply Brief at 40).

iii. CLEC Coalition

The CLEC Coalition proposes a 95 percent fill factor. The CLEC Coalition argues that Verizon's proposal fails to recognize that: (1) channel units can be added on very short notice as demand emerges, thereby eliminating the need for all but a minimal number of spares; and (2) because channel units can be placed to match closely the total number of end users served by a DLC system, a very high rate of utilization can be achieved (CLEC Coalition Brief at 52-54).

b. Analysis and Findings

Verizon's proposed fill factor for channel units of 80 percent is ten percent higher than its fill factor of 70 percent for year 2001 (see Exh. ATT-VZ 14-26). Although Verizon claims that the maximum fill is 90 percent for channel units, Verizon's own guidelines do not specify the maximum fill for channel units; they provide only the relief interval of six to twelve months (see Exh. ATT-VZ 3-5-P, Att. at 16). Considering that there is a high flexibility for capacity adjustment (i.e., the relief interval of six to twelve months), we direct Verizon to use an 88 percent fill factor for channel units in a forward-looking network.

8. Central Office Terminal Fill Factor

a. Positions of the Parties

i. Verizon

Verizon states that because it is not adding more SLC 96 or Series 5[92] to the network, the embedded COT base is not relevant for a forward-looking cost study. Verizon also states that with a Litespan Next Generation Digital Loop Carrier ("NGDLC"), Verizon assumes an add/drop configuration, which typically increases the ratio of RT to COT to 3:1. Verizon states that the ratio of RT to COT is not one input or assumption of the cost study; rather it is

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92 These are equipment or systems for COTs currently used in Verizon's network. Subscriber Line Carrier 96 ("SLC 96") functions as a remote concentrator for up to 96 analog local loops. Newton's Telecom Dictionary, 17th ed. at 630.

the result of looking at several hundred feeder routes in the survey and determining how many RTs are on that feeder route. Verizon adds that because the physical layouts of routes dictate the ratio of RT to COT, changing the ratio to 5:1 for a particular area does not make sense, and the model would have "picked up" the maximum ratio in the survey "when it made sense" (Tr. 17, at 3432-3439).

ii. CLEC Coalition

The CLEC Coalition argues that a COT can achieve a higher fill than an RT because a COT serves up to five RTs, which means that, depending on the size of the RTs, a COT can be engineered to serve an optimal level of RTs (Exh. CC-3, at 40). The CLEC Coalition argues that Verizon's own records show that Litespan NGDLC as well as the embedded COT, such as SLC 96 or Series 5, can serve up to five RTs (id. at 41, citing Exh. ATT-VZ 3-5, Exh. CC-VZ 2-17). The CLEC Coalition argues that a COT can achieve a higher fill factor in a forward-looking network. The CLEC Coalition contends that under Verizon's forward-looking network design, there will be extensive deployment of fiber, and, therefore, a much larger number of RTs and COTs than in Verizon's current network. According to the CLEC Coalition, as a result, COTs can be engineered to achieve a fill factor as high as 90 percent (CLEC Coalition Brief at 53).

b. Analysis and Findings

Because it is not clear from the CLEC Coalition's proposal how the 5:1 ratio of RTs to a COT translates into a 90 percent fill factor for a COT, we will determine the COT fill factor in terms of the RT to COT ratio. Although the 5:1 ratio is the optimal level that a COT can achieve, Verizon reasonably explains that the ratio is an output rather than an input or assumption used in the cost study (see Tr. 17, at 3432-3439). Verizon also explains that regardless of how many RTs are connected to a COT, only 2,024 DS0s can feed from a Litespan (see id. at 3439). In addition, we believe that our directives for other inputs that directly impact the ratio, such as copper/fiber proportions and other fill factors, may require adjustment in the number of, or the level of investment in, COTs and RTs, thereby changing the RT to COT ratio. We conclude that the ratio of RT to COT should be determined as an output by running the model with other input adjustments. In its compliance filing, we direct Verizon to calculate a new RT to COT ratio and to submit workpapers that show how adjustments in other related inputs affect that calculation.

D. House and Riser Cable

1. Introduction

Vertical house and riser cable runs vertically between the basement and the upper floors of a building, terminating in riser closets located on each floor. Each end is "punched down" or terminated on termination blocks. Horizontal house and riser cable brings the telephony or data signal from the riser cable directly into the tenant's location. It is "punched down" on termination blocks cross-connected to the riser cable and terminated on the end-user's telephone jack.

The Department previously approved Verizon's HARC cost study in the Consolidated Arbitrations Phase 4-L Order and then approved terms and conditions for HARC in the Phase 4-L and Phase 4-Q Orders. Verizon tariffed its rates, terms and conditions for HARC on February 3, 2000. The Department approved Verizon's HARC tariff in D.T.E. 98-57–Phase II on May 4, 2000.

2. Positions of the Parties

a. Verizon

Verizon proposes rates to recover costs for HARC, which consists of riser cable and horizontal cable within a multi-story building that provides access to the network side of end-users' network interfaces from a point of interconnection within the building (Verizon Brief at 128). Verizon calculates proposed HARC rates by determining the NRCs of building set up, which involves installing a backboard and a connecting (50-pair terminal) block (id. at 129). The recurring costs for vertical house and riser, developed on a per pair basis, include the fixed investment of six 50-pair terminals located close to the entrance, 30 feet of 300-pair metallic horizontal intra-building cable, and a 50-pair terminal with 20 feet of 50-pair stub cable located on or close to the customer's floor; and the variable investment of ten feet of 300-pair metallic intra-building cable (id.). Horizontal house and riser investments include 150 feet of 300-pair metallic horizontal intra-building cable, and a 50-pair terminal with 20 feet of 50-pair stub cable located on or close to the customer's floor (id.). These investments include the metallic pair of HARC itself, the terminations, and the labor associated with the termination of the pair at a location close to the entrance cable, usually the basement, divided by a utilization factor of 40 percent and converted to monthly cost through the application of ACFs associated with the intra-building Account No. 2426 (id. at 128-129). Verizon states that current vendor material prices and installation prices are obtained from the ECRIS, with the cost deaveraged by density zones due to differing installation costs (Exh. VZ-36, at 119).

In defending the travel times in its cost study for installation of a terminal block and backboard, Verizon argues that one must account for the time required for the technician to travel to the building in order to perform the work, as well as costs associated with the labor required for engineering the job and purchasing the material (Verizon Brief at 132). Regarding the fill factor, Verizon defends its cost study and responds to AT&T and WorldCom's claim by saying that the competitors' proposed fill factors "completely ignore the physical realities of installing house and riser cable" (id. at 131). Verizon contends that HARC is basically distribution cable in a building, and the same principles apply when determining the design and size of HARC. Verizon states that, because "the distances in a building are short, the higher cost of material associated with lower house and riser fill factors pales in comparison to the cost of rework and reinforcement required when there is insufficient capacity" (id. at 131).

With respect to the optional terminal block, Verizon states that its design is consistent with the requirements set forth by the Department, whereby a CLEC may choose to employ Verizon's building set-up option and pay for installation of a backboard and terminal block, i.e., a one-time nonrecurring building set-up fee. Verizon claims that it does not propose to change the existing tariff or violate the Department's prior determination. Lastly, addressing the issue of cable length, Verizon argues that AT&T's "sample" data for the average length of horizontal cable are "incomplete" and "unsubstantiated" (id. at 133). Verizon asserts that its length of 150 feet is more reasonable since it is based on an estimate provided by Verizon personnel with actual experience placing these types of cables, whereas it is unclear whether AT&T's sample, gathered by its AT&T Broadband affiliate, is representative of all building types. Verizon further questions the ownership of the wiring, methodology of the measurement, and statistical accuracy (id.). In conclusion, Verizon suggests that AT&T may not object to the higher rate if Verizon were to charge on a per foot basis rather than on an average length basis, because AT&T and WorldCom's proposed cable investment is actually more than twice the amount proposed by Verizon on a per foot basis (id.).

b. AT&T

AT&T argues that the Department should reduce Verizon's proposed recurring charge for HARC, since Verizon's claimed recurring cost for the monthly use of a terminal block is grossly overstated, due in large part to unreasonable assumptions, including installation time, material cost, network plant configuration, and fill factors. Moreover, AT&T urges the Department to reject altogether Verizon's proposed $112.93 charge for an intermediate termination block (AT&T Brief at 169).

First, AT&T contends that Verizon's model overestimates the material and labor cost to install a simple 50-pair punch-down termination (id. at 172). Whereas Verizon quotes a cost of $442.09, AT&T argues that "a reasonable installed cost of such a termination would be $32.00" (Exh. ATT-28, at 37). AT&T further contends that "it takes [approximately] 26 minutes to travel between floors and place a simple $6 punch-down terminal block and backboard," while insisting that Verizon's model assumes 352 minutes for the same function (id. at 42). AT&T states that Verizon suggests termination rates of 21 to 48 pairs per hour for floor work and seven to 16 pairs per hour for basement work, while it points out that the FCC has proposed a cable termination rate (i.e., a rate for punch down of pairs onto a terminal) of 200 pairs per hour (id. at 41, citing Inputs Further Notice at ¶ 140). AT&T argues in response to Verizon's travel time reasoning that this element "would add little [time] to a terminal block installation on a per floor basis, and performed at the same time as other jobs are being performed" (AT&T Brief at 176) (emphasis in original).

Second, AT&T argues that the fill factor for HARC should be at least five percentage points higher than the fill factor to be determined for distribution plant (id. at 174). AT&T argues that certain factors that affect the uncertainty of use of distribution plant, such as "changes in zoning, amount and pace of development, and the likelihood of additions to existing subdivisions and even existing houses within subdivisions," do not apply to HARC, and that the overall size and layout of an office or apartment building will change little (id.).

Third, AT&T contends that Verizon assumes a horizontal cable length of 150 feet based on "the judgment of Verizon's Outside Plant Engineers," whereas AT&T proposes a horizontal cable length of 90.6 feet based on its sample survey of 23 residential multi-tenant units ("MTUs") throughout New England. AT&T refutes Verizon's claimed length, stating, "[s]ince horizontal cable runs between the telephone closet on a floor and an end user's unit, and since the telephone closet is usually placed in or near the elevator banks in the middle of each floor, such an assumption requires a building that is approximately 300 feet from one side to the other — the size of a football field" (id. at 175). Accordingly, AT&T recommends that Verizon's assumed cost for horizontal cable be reduced by 39.6 percent to reflect the difference between 150 and 90.6 feet (id.).

AT&T also disputes the reemergence of an extra, intermediate "new backboard with 50-pair block terminal" (Exh. ATT-28, at 33). AT&T argues that the Department previously rejected Verizon's construct in the Consolidated Arbitrations, eliminating the requirement for a separate terminal block between Verizon's terminal block and the CLEC terminal block, including the connecting cable (AT&T Brief at 177, citing Phase 4-L Order at 36).

Lastly, AT&T objects to Verizon's use of a 20-foot length of 50-pair cable stub, which connects a portion of the cable's pairs to a terminal block (AT&T Brief at 172). AT&T asserts that the cable stub and the resulting splice that it requires are unnecessary, simply adding an "unnecessary splice point to join a 50-pair cable to a 300-pair cable" (Exh. ATT-28, at 38-40; AT&T Brief at 172).

c. CLEC Coalition

The CLEC Coalition contends that Verizon's utilization factor of 40 percent – drawn from its distribution loop cost model, which bases its utilization factors on forecast uncertainties, customer inward/outward movement, random fluctuations in demand, future growth, maintenance requirements, etc. – is too low. The CLEC Coalition contends that the Department should adopt a higher fill factor for distribution cable and increase the fill factor for HARC commensurately, since these two fill factors should be the same (CLEC Coalition Brief at 56). The CLEC Coalition explains that HARC is more easily adjusted than many distribution cables and that certain reasons for adjusting downward the distribution fill "in view of zoned land that has not been developed, etc. simply do not apply to HARC," thus requiring the HARC fill factor to be "equal to, if not higher," than the fill factors for distribution cables (id.).

d. DOD/FEA

The DOD/FEA urges the Department to ensure equal access by all carriers to the cable in buildings where federal offices are located (DOD/FEA Brief at 15-16). The DOD/FEA suggests that it should not be necessary to provide a great deal of extra plant to allow for growth and churn because the overall size and layout of an office or apartment building will change little, and it should be relatively easy to estimate the total future requirements for wire pairs. The DOD/FEA, therefore, proposes a fill factor of 60-70 percent, stating "beyond a certain point, current customers should not be required to fund future income streams" (id. at 17). The DOD/FEA also agrees with AT&T's claim that Verizon overestimates costs for HARC due to Verizon's exaggerated work times for cable terminations (id. at 18).

3. Analysis and Findings

First, we address the issue of an intermediate terminal block. Verizon proposes a nonrecurring charge of $112.93 for installation of an intermediate terminal block, whenever there is a need for cross-connection between Verizon's and a CLEC's terminal blocks (Exh. ATT-VZ 19-1). In the Phase 4-L Order, the Department "eliminate[d] the requirement for a third termination block and for [Verizon] to perform cross-connection activities." Phase 4-L Order at 35. There, we found that CLECs could perform their own cross-connection activities to cross-connect directly to Verizon's HARC in the most efficient manner possible and that CLECs did not have to use an intermediate block. Id. In this case, Verizon seems to argue for reconsideration of that decision, contending that it should be allowed to charge CLECs for an intermediate block regardless of whether or not the CLEC requests the intermediate terminal block (Exh. ATT-VZ 19-1). Verizon has not persuaded us to depart from our decision in the Phase 4-L Order. Likewise, what Verizon has termed the "service establishment terminal charge" in its tariff is only applicable when a CLEC explicitly requests that there be a third, intermediate terminal block between its own and Verizon's terminal blocks (Tr. 13, at 2652-2653). Therefore, we direct Verizon to modify its tariff to indicate that the "service establishment terminal charge" is applicable only when the intermediate terminal block is requested (see Tariff No. 17, Part M, Section 2.12.2).

Regarding the issue of work time (or task time) estimates for termination activities, we are faced with two extremes. AT&T proposes a work time estimate of 26 minutes for a technician to perform a termination, while Verizon estimates the tasks will take 352 minutes (Exh. ATT-28, at 43). Verizon bases its estimate on data from the ECRIS, while AT&T's estimate is derived from its witnesses' experience as well as data contained in the FCC's Synthesis Model (id.). There are five major components to the terminal cost: (1) travel time costs; (2) material and labor costs for the engineering and placement of the terminal block and backboard; (3) labor costs for the termination (or "punch down") activities; (4) material and labor costs for the placement of 20-foot cable stub; and (5) labor costs for splicing the stub to cable (id.).

First, Verizon estimates 53 minutes of travel time, which includes travel between the technician's office and the worksite as well as between floors at the worksite; AT&T, in comparison, estimates five minutes for travel time, but does not include travel time to and from the worksite in its estimate (id.). We find that AT&T's estimate is unreliable because it does not include travel time to and from a worksite. Moreover, AT&T's criticism of Verizon's travel time estimate is unreasonable, because the number of tasks to be performed at any worksite does not affect the amount of travel time to and from that worksite. Therefore, because it accounts for all necessary travel, we find Verizon's travel time estimate to be reasonable.

Second, concerning the work time estimates for placing the terminal block and backboard, Verizon proposes roughly 53 minutes and AT&T estimates six minutes (id.).[93] Verizon's cost study also includes the labor required for engineering the job and purchasing the material. AT&T contends that the purchase and installation of backboards and punch-down blocks is not a sophisticated engineering and purchase decision, and building owners routinely provide backboards (see AT&T Reply Brief at 118-119, citing Exh. ATT-28, at 38). We agree with AT&T that Verizon has not presented persuasive evidence on why a rather simple task of placing the terminal block would require time-consuming engineering and purchasing activities. However, AT&T's time estimate of one minute for installing the terminal block is unreasonable. Considering the uncomplicated nature of work involved, we find that a reasonable estimate for time to place a terminal block is ten minutes, and we direct Verizon to eliminate the backboard time element based on its own statement that "[b]uilding owners must provide backboards, holes between floors, and conduit to allow for Verizon to place house and riser facilities" (Verizon Brief at 131).

Third, we believe that Verizon has overstated the work times for terminating HARC, for reasons that are inconsistent with the FCC's rationale in its Inputs Further Notice at ¶ 140, where it found that neither feeder nor distribution block installation is a complicated procedure. The tasks for termination, as described by AT&T, consist of: (1) stripping off the outside cable sheath to expose twelve 25-pair binder groups in the 300-pair cable, in order to isolate

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93 Verizon and AT&T break down the cost elements somewhat differently. Verizon includes the placement of the terminal block along with travel time. But this has little effect on our analysis and conclusion, since we consider the time required for placing the terminal block along with the termination of the backboard.

two 25-pair binder groups (a total of 50 pairs of lines); and (2) pushing each wire into one of the terminal clips on one side of the punch-down terminal and cutting off the excess wire (Exh. ATT-28, at 38). Although installation conditions may not always be ideal, it is unreasonable for 50-pair punch down to require 77 minutes, as Verizon suggests. AT&T states that Verizon's assumptions are inflated, and instead recommends 200 pairs per hour, stating that its witness' own experience installing such terminal blocks and supervising the installation of them confirms the FCC's recommendation of 200 pairs per hour (AT&T Brief at 173). Considering the relatively simple nature of the task and giving consideration to the possibility of less than ideal work conditions, we make a 25 percent downward adjustment to AT&T's recommendation and direct Verizon to adopt a cable termination rate of 150 pairs per hour.

Lastly, concerning the issue of the need for a 20-foot length of 50-pair cable stub, we find that AT&T's argument has merit. Verizon contends that the cable stub is necessary because it is not possible to strip off the outside cable sheath of the 300-pair riser cable to expose the 50-pair cable that is to be cross-connected to the 50-pair terminal located on or close to the customer's floor. We disagree with Verizon's statement that it is not possible to "stretch" these pairs from the rise to the backboard without the use of a cable stub. On the contrary, it is not only feasible but also more efficient to directly terminate to the riser cable (Exh. ATT-28, at 39). Therefore, we direct Verizon to eliminate the cost of the cable stub from its cost study. In conclusion, adopting changes to all five work elements, we direct

Verizon to reduce the work time estimate for installing a 50-pair terminal block from 352 minutes to 83 minutes while accounting for appropriate material costs.[94]

Next, we address the issue of the HARC fill factor. Verizon proposes the same fill factor for HARC as it does for the distribution portion of the loop UNE (see Section VI.C.3, above). This fill factor of 40 percent includes a reduction of ten percent for "zoned land that has not been developed." As the CLEC's persuasively argue, HARC is unique in that a building's maximum capacity – and, therefore, the maximum demand for HARC – is known at the time of building construction, thus, rendering the "zoned land" issue irrelevant for HARC. Verizon defends its fill factor of 40 percent by stating that the cost of rework and reinforcement (i.e., to add additional capacity) would be too great if, and when, it is confronted with insufficient capacity, but does not show that buildings are constructed with undercapacity or undersized cable in the first place (Verizon Brief at 131). We agree that such rework, if it were needed, would be expensive, and we recognize the importance of adequately-sized cable. However, Verizon has failed to show why a ten percent adjustment for undeveloped zoned land would apply to the HARC fill factor as opposed to the distribution fill factor. Therefore, we believe a reduction to account for undeveloped zoned land is not appropriate for the HARC fill factor. Furthermore, we find that it is unnecessary for Verizon

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94 From the breakdown of work time elements presented in Exh. ATT-28, at 43, we direct Verizon to incorporate the following changes: (1) separate out and add terminal block termination time of 10 minutes; (2) eliminate backboard placement time of 53 minutes; (3) reduce termination rate to 150 pairs per hour, resulting in 20 minutes of work time for 50 pairs; and (4) eliminate work time for cable stub placement and splicing of 169 minutes. This results in a reduction in termination labor time from 352 minutes to 83 minutes.

to include an adjustment for potential loss to competitors in its development of a fill factor for HARC, because once Verizon has installed house and riser cable, and interior construction in a building is complete, it is unlikely that another provider will then deploy alternative facilities (see Tr. 13, at 2663-2664). Accordingly, we direct Verizon to eliminate the adjustment for undeveloped zoned land and loss to competitors, and to revise its HARC fill factor to 51.3 percent.[95] Next, we address the issue of horizontal cable length. Verizon proposes an average of 150 feet based on its expert opinion (Verizon Brief at 133), while AT&T proposes 90.7 feet based on a formal survey (AT&T Brief at 175). Verizon disputes AT&T's survey results primarily on the grounds that non-residential buildings were excluded from the survey, while AT&T discredits Verizon's recommendation as being unsupported (id.). We find problems with both parties' evidence. The credibility of AT&T's survey data suffers because it does not include data from commercial buildings, even though HARC is largely located in commercial buildings (see RR-DTE-76). Furthermore, its samples were not statistically selected, which further undermines the reasonableness of the data (see Tr. 15, at 2945). Verizon, on the other hand, relies strictly on the opinions of its experts in the field and fails to support their assertions with survey or engineering records. Verizon indicated in the Consolidated Arbitrations that it could provide a listing of the buildings in which it owns HARC. Phase 4-L Order at 37. This demonstrates that Verizon has the ability to access and conduct a study to determine the average horizontal cable length; yet it failed to do so. Recognizing these limitations of AT&T's and Verizon's proposals, and applying our expert judgment, we

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95 The calculation is as follows:

[(1.2/2) x 100%] x [100% - 5%] x 90% = 51.3%].

determine that the average length of horizontal cable would fall somewhere in between 90 and 150 feet. We direct Verizon to reduce its recommended length by ten percent to 135 feet. This adjustment relies only in part on AT&T's survey, because the survey excludes commercial buildings (see Exh. ATT-28, at 36-37; RR-DTE-76), and thus we direct Verizon to use a cable length that is closer to its proposed value than that of AT&T. In future TELRIC proceedings, we require Verizon to submit additional evidence, such as a survey or engineering records, in support of its proposed horizontal cable length.

E. Dark Fiber

1. Introduction

Dark fiber is the fiber optic portion of Verizon's network that is not connected to the electronic equipment needed to "light" a line to transmit information over it. A CLEC that requests access to dark fiber is responsible for installing any fiber optic transmission equipment or intermediate repeaters needed to activate the fiber. A CLEC can order three types of dark fiber – IOF, IOF Channel Termination, or Loop dark fiber – from a CLEC point of presence ("POP") to the Verizon end office that serves the specific POP (Exh. VZ-36, at 124).

Verizon has proposed rates to recover the cost for offering spare, unlit, continuous fiber optic cable without any attending electronics or photonics (Verizon Brief at 122). AT&T did not submit cost studies for dark fiber rates.

The Department previously approved Verizon's dark fiber cost study and terms and conditions in the Consolidated Arbitrations Phase 4-N Order at 40. The Department approved the rates, terms, and conditions for dark fiber in tariff form in D.T.E. 98-57–Phase II.

2. Positions of the Parties

a. Verizon

Verizon developed the dark fiber cost study on a fixed and variable basis. For Loop dark fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile, a monthly fixed serving-wire-center cost, and a monthly customer-premise cost (where appropriate). For IOF dark fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile and a monthly fixed cost per serving wire center. For Channel Termination dark fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile, a monthly fixed POP Fiber Distribution Frame ("FDF") cost, and a monthly fixed cost per serving wire center (Verizon Brief at 123). According to Verizon, the fixed investments represent the fiber distribution frames and jumper cables, while the variable investments represent the fiber optic cable and associated supporting structure, developed on a per one tenth of a mile basis. Additionally, the recurring costs may include fiber-pair terminations (and associate fiber jumpers) when Verizon is required to provide any intermediate CO connections for the dark fiber between the serving wire centers. The investments used in the dark fiber cost study are based on the same fiber distribution frames, fiber cable, and associated support structure unit investments that are incorporated in Verizon's IOF and Loop cost studies (id.).

Verizon proposes two NRCs related to the processing of dark fiber service orders: (1) optional cable documentation; and (2) service date change. Verizon proposes to bill the other dark fiber NRCs – a record review charge, an optional field survey charge, an optional testing charge, and a splicing charge – on a time and materials basis.

Because each tenth of a mile is billed based on Vertical and Horizontal ("V&H") coordinates, a route-to-air adjustment of 1.265 is applied to the variable investments to approximate the actual path of the cable. The variable investments also incorporate weightings to represent the percentages of each type of fiber-optic cable and its associated supporting structure assumed within each tenth of a mile. The fixed investments have been adjusted with loading factors to account for installation, land, buildings, and power where applicable. Each fixed and variable investment has incorporated engineering utilization adjustments and annual cost factors, which was then divided by twelve to derive each monthly cost (id. at 123-124).

Verizon responds to AT&T's criticism of its proposal, stating that AT&T has misunderstood its cost studies, particularly the development and use of utilization factors. Verizon states that it considers all known and potential demand when sizing fiber cables, including dark fiber elements, and not just POTS and special services demand (Tr. 13, at 2617; Verizon Brief at 124-125). Verizon refutes AT&T's arguments of double recovery by stating that the utilization factor is applied to the investment only once by the manner of allocating costs "on the basis of a per-fiber strand, either to the loop study or to the dark fiber study" (Tr. 13, at 2628; Verizon Brief at 126). Verizon further explains that there is no double recovery when Verizon leases dark fiber, because on average there is offsetting investment required in order to maintain the ongoing required reserve capacity. The extent of spare capacity, according to Verizon, in its network remains constant over time, i.e., the proposed 60 percent fiber utilization level is a "steady state" (Verizon Brief at 127-128). Moreover, Verizon characterizes AT&T's recommendation for a 100 percent utilization factor for dark fiber as "absurd," arguing that no practical system can or should be operated at 100 percent utilization (Exh. VZ-38-A, at 50; Verizon Brief at 128).

On the issue of deaveraging, Verizon contends that the CLEC Coalition's argument for deaveraging is "illogical and inconsistent with other positions it has taken" (Verizon Reply Brief at 152). While stating that the CLEC Coalition's claim regarding dark fiber loops not crossing zones is incorrect, Verizon argues that interoffice dark fiber is "a continuous strand between one central office and another," possibly crossing zones (id.). Verizon also states that it has not deaveraged costs for dark fiber or interoffice transport generally, and that there is "significant administrative burden, and dubious value" associated with deaveraging dark fiber in general and interoffice dark fiber in particular (id. at 152-153).

b. AT&T

AT&T contends that Verizon's proposal allows double recovery in that the total cost of the 40 percent spare dark fiber in the loop and 25 percent spare dark fiber in the interoffice network are recovered in the UNE loop rates. More precisely, AT&T argues that:

> For POTS and special services UNEs, Verizon's cost study assumes outside plant investment for fiber cable and the structures used to house the cable, divided by normal POTS and special services demand, with recurring costs adjusted upwards by a claimed fill factor . . . . Verizon then claims its costs for a parallel dark fiber cable network (which is actually the very same network) with its own fill factors [and structures]. This results in double counting of cable and structure costs because Verizon fails to fully allocate costs to all of the UNEs involved for a single fiber cable network [Exh. ATT-28, at 46].

Moreover, AT&T contends that imposing a 60 percent fill factor on dark fiber is unreasonable: "Since Verizon is not required to build dark fiber for competitors, and it has taken a position not to do so, then having administrative spare on top of dark fiber is nonsensical" (id. at 49). For these reasons, AT&T recommends pricing loop and transport

UNEs at an assumed 100 percent fiber fill rate (50 percent with full redundancy), which would allow Verizon to recover all of the cost of the cable sheath and utilize all fibers. This cost per used fiber strand, argues AT&T, then could be applied to the Dark Fiber cost study (id. at 48-49).

c. CLEC Coalition

Similarly, the CLEC Coalition proposes modifications to Verizon's fill factors for dark fiber loop, IOF, and channel termination in order to prevent Verizon from including the capacity cost of "spare" fiber in the loop and transport studies and then a second time in the dark fiber cost study (CLEC Coalition Brief at 85). The CLEC Coalition asserts that Verizon does not consider dark fiber demand for cost recovery purposes, and the fill factor designated by the Department for the loop and IOF facilities will already compensate Verizon for the unused portion of the fibers.

Furthermore, the CLEC Coalition contends that dark fiber loop rates should be deaveraged because of significant cost variations. It argues that the average investment per foot per fiber in the Metro and Urban zones are below the statewide average due to cost variations in aerial, underground, and buried fiber (id. at 86). The CLEC Coalition also explains that dark fiber loops, unlike dark fiber IOFs, can be identified as to which zone they belong.

3. Analysis and Findings

We agree with Verizon that AT&T and the CLEC Coalition misconstrue its dark fiber cost study. Verizon correctly notes that the spare in its dark fiber cost study may not be equated with actual spare in the network. Verizon's dark fiber cost study is an extension of the

IOF and fiber feeder loop cost study, in which first the capacity cost of each element is determined and then a utilization factor[96] is applied to account for spare. Dark fiber is treated not as administrative spare but as a network element that can be leased to a requesting CLEC. Furthermore, Verizon states that it maintains a constant amount of spare capacity in its network, making investments to offset network utilization beyond the target level. As a result, we conclude that there is no double recovery when Verizon leases dark fiber because it is already accounted for in the higher than actual utilization rate, and, on average, an offsetting investment is made to maintain the ongoing stated reserve capacity. Therefore, the relevant issue for dark fiber cost recovery is the level of utilization in its loop and IOF cost studies, and whether the fill factors are set to reflect a reasonable level of forward-looking demand for dark fiber. Accordingly, as determined in Sections VI.C.5 (Fiber Feeder Fill Factor) and VIII.D (IOF Utilization Factors) of this Order, we reiterate that a reasonable level of utilization to serve the total element demand, including future demand for dark fiber, is 75 percent for dark fiber loop (i.e., the same fill factor we have determined for fiber feeder) and 80 percent for dark fiber IOF (i.e., the same fill factor we have determined for fiber IOF).

Concerning the issue of deaveraging, we direct Verizon to deaverage the dark fiber loop. Verizon has already deaveraged costs associated with loops, and the fact that dark fiber crosses different zones is irrelevant because dark fiber loop is serviced by wire centers located within particular zones. In the Local Competition Order, the FCC stated that the Act mandates that rates for interconnection and unbundled elements be based on the cost of providing the interconnection and network elements. The FCC stated that "deaveraged rates more closely

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[96] "Utilization factor" is synonymous with fill factor.

reflect the actual costs of providing interconnection and unbundled elements" and concluded that "rates for interconnection and unbundled elements must be geographically deaveraged." Local Competition Order at ¶ 764. Although Verizon argues that deaveraging dark fiber will substantially increase its administrative burden, this concern is overstated given the fact that it has already deaveraged loop costs, and that the loop dark fiber model draws its parameters from the loop model. Moreover, the cost variation is not negligible. The "Dark Fiber Loop Fiber/Structure Inputs" section of the cost study indicates that the statewide, weighted average investment per foot per fiber of underground fiber, for example, is $0.095 compared with the Metro zone average of $0.068 (Exh. VZ-37, Part F-1, Section 5.13, at 1). In the aggregate, the difference of $0.027 per foot per fiber can be significant because the average length of a loop that CLECs purchase in the Metro zone is 3,239.88 feet (Exh. ATT-VZ 2-5). Moreover, the record shows that underground structures make up 100 percent of feeder plant in the Metro zone, 72.33 percent in the Urban zone, and 67.19 percent in the Suburban zone (Exh. ATT-VZ 2-21). These differences in underground structures among different zones can lead to significant cost variation for dark fiber loops by density zone. Therefore, we adopt the CLEC Coalition's proposal to deaverage dark fiber loop rates. As we state in the immediately following Section VI.F, Verizon shall submit costs deaveraged among four zones and shall also submit costs deaveraged among three zones (i.e., with the Metro and Urban zones combined).

F. Geographic Zones For Deaveraging Loop Costs

1. Introduction

The FCC has stated that UNEs should be geographically deaveraged where there are significant cost variations. Local Competition Order at ¶¶ 760-766. Three zones, based on the population density, are "presumptively sufficient" to account for geographic cost differences in setting UNE rates. Id. at ¶ 765. States may use these three rate zones, or they may establish more than three zones where cost differences in geographic regions are such that additional zones are needed to adequately represent UNE costs. Id.

In the Consolidated Arbitrations, Verizon proposed three density zones for determining loop rates, but the Department directed Verizon to create four zones based on AT&T's request to separate the four densest wire centers in downtown Boston from the Urban zone to create the Metropolitan zone. Phase 4 Order at 61-64. Based on that Order, Verizon currently classifies its wire centers into four density zones according to the number of access lines per square miles covered by the wire center (see RR-AG-1).

The four density zones, listed in Verizon's D.T.E. Tariff No. 17, Part A, Section 5.1, are Metropolitan (or "Metro"), Urban, Suburban, and Rural. The total number of Massachusetts wire centers, 273, is distributed among the zones as follows: Metro (central Boston wire centers) – 4; Urban (greater than 1500 lines per square mile) – 40; Suburban (150 to 1500 lines per square mile) – 148; and Rural (less than 150 lines per square mile) – 81 (RR-DTE-1; RR-AG-1). Verizon does not propose to change its existing four-zone density classification for loops, but AT&T now proposes three density zones: Suburban, Rural, and an Urban zone combining the current Urban and Metro zones.

2. Positions of the Parties

a. AT&T

AT&T requests that the Department consolidate the Metropolitan and Urban zones because the Metro zone of only four wire centers "bears no relation to practical marketing considerations" (AT&T Brief at 140). Though AT&T was the original proponent of four zones, AT&T now asserts that it is inappropriate "to carve out four downtown Boston wire centers as a separate Metropolitan zone" (id.). AT&T argues that while Manhattan is appropriately a separate geographic density zone in New York because it is "large enough to have a critical mass of potential customers that a CLEC can market separately if it chooses to do so," downtown Boston is "a lot smaller than Manhattan" and does not merit a separate zone (id. at 140-141).

In this investigation, AT&T states, Verizon has defined geographic density zones based on prior Department orders, starting from a premise of four zones, including the Metropolitan zone (id. at 141, citing Tr. 9, at 1859). According to AT&T, Verizon did not voice any opposition in this proceeding to the notion of recombining the Metropolitan and Urban zones, and merging them would make "no difference from the perspective of recovering forward-looking cost" (AT&T Brief at 141, citing Tr. 9, at 1804-1805; Tr. 17, at 3520-3521).

b. Attorney General

The Attorney General requests that the Department require Verizon to amend Tariff No. 17 based on Verizon's reclassification of some of its wire centers to different density zones (Attorney General Brief at 3). Typically, CLECs order UNEs based on the wire center closest to the customer they plan to serve (id.). The Attorney General notes that Verizon explained during the evidentiary hearings that, since the Consolidated Arbitrations proceeding, it has reclassified about 20 Massachusetts wire centers to different density zones (id., citing Tr. 17, at 3391-3395), and subsequently Verizon provided an updated list of wire centers by density zone (RR-AG-1S). The Attorney General asserts that, based on this information, the

Department should require Verizon to amend D.T.E. Tariff No. 17 so that competing carriers can predict the costs of providing service to their customers (id.).

3. Analysis and Findings

a. Number of Geographic Density Zones

Verizon did not address AT&T's argument regarding the appropriate number of density zones. In response to questions posed by AT&T during the evidentiary hearings, Verizon's witness Michael Anglin acknowledged that Verizon had not re-evaluated the need for a fourth density zone for purposes of this proceeding, but assumed that the density zones would remain as established in the Phase 4 Order (Tr. 9, at 1806, 1859).

The FCC stated in the Local Competition Order that states should establish density zones for determining UNE costs based on "significant cost differences." In the Consolidated Arbitrations proceeding, AT&T and WorldCom advocated the creation of the Metro zone because the four downtown Boston wire centers had "densities that set them far apart from the next highest in the urban zone," and the "cost characteristics of this zone are sufficiently different that the TELRIC study should disaggregate this group from the rest of the urban zone." Phase 4 Order at 62. AT&T does not now argue that that the densities or cost characteristics of the zones established in Phase 4 have changed. The only rationale AT&T offers for reclassifying the metro wire centers into the Urban zone – "marketing considerations" – is not cost-based, and thus not in keeping with the FCC's directive.

The data Verizon has filed in this proceeding indicate that the cost gap between the Metro wire centers and the Urban wire centers has narrowed since the Phase 4 Order[97] (see RR-AG-1[98]; RR-DTE-48; Exh. VZ-37, Part B-1). The minimal information in the evidentiary record does not provide us with sufficient basis to modify the density zones at this time. See Phase 4 Order at 63-64. However, because the various directives (regarding cost of capital, depreciation, fill factor, copper/fiber thresholds, IDLC/UDLC, etc.) in this Order will affect the relative costs of the density zones, it is premature to consider whether cost differences justify maintaining four zones. We find that we can better assess whether significant cost differences exist between the Urban and Metro zones, and thus make an informed decision about the appropriate number of density zones for Massachusetts, upon review of Verizon's compliance filing. Accordingly, Verizon is directed to submit, in its compliance filing, two versions of those portions of Part B of its cost study that are affected by geographic deaveraging, including all workpapers associated with its calculation of the possible consolidated Urban zone. This issue affects only the Local Loop, Dark Fiber and DC Power Consumption portions of Verizon's Recurring Cost Study,[99] and thus we find that it would not be burdensome for Verizon to submit cost results for, alternatively, four density zones and

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[97] See Exh. VZ-37, Part B-1, containing loop cost results, including monthly cost by density zone; and Phase 4 Order at 64, detailing costs for Combined Urban, Boston Exchange, and Other Urban wire centers.

[98] The information in the attachment, including the number of working lines per square mile, is proprietary (RR-AG-1).

[99] We note that the density zone classification affects only certain portions of Verizon's cost studies, including sections within Part B such as "Massachusetts Monthly Cost Summary," Sections 2 and 3.1 through 3.3.

three density zones. In its compliance filing, Verizon shall estimate administrative, advertising, provisioning, or other costs associated with a consolidation of density zones. If Verizon does anticipate significant costs associated with the implementation of a rate structure change associated with a Metro/Urban zone consolidation, it shall submit detailed information about such costs with its compliance filing.

b. Reclassification of Wire Centers

Regarding the wire centers moved from one density zone to another, in response to the Attorney General's questions at the hearing, Mr. Anglin stated that any such changes would be included when Verizon filed its tariff (Tr. 9, at 1863). As the Attorney General makes a reasonable request that Verizon keep the classification of wire centers current, we agree that Verizon should so update its tariff in compliance with this Order. In addition, we find that Verizon shall, as a matter of course, modify Tariff No. 17 whenever it changes a wire center's zone classification.

G. Line Sharing and Line Splitting

1. Introduction

In its Line Sharing Order,[100] the FCC required ILECs to unbundle the high-frequency portion of the loop to enable CLECs to offer xDSL services. The FCC found that "access to the high frequency spectrum of a local loop meets the statutory definition of a network element" and that "it is technically feasible for an incumbent LEC to provide a competitive LEC with access to the high frequency portion of the local loop as an unbundled network

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100 On May 24, 2002, the U.S. Court of Appeals for the D.C. Circuit vacated and remanded the Line Sharing Order. See n.2 in Section I, above.

element." Line Sharing Order at ¶ 25. In addition, the FCC found that ILECs "must allow competing carriers to offer both voice and data service over a single unbundled loop." Line Sharing Reconsideration Order at ¶ 18. This arrangement, where CLECs offer both the high and low frequency portion of one loop, is characterized as a line-splitting arrangement. The Department first set operational standards and rates for line sharing and line splitting in D.T.E. 98-57-Phase III.

Verizon's proposed line sharing rates are intended to recover the costs of provisioning the high-frequency portion of the loop facility for xDSL service offerings, whereas the proposed line splitting rates seek to recover Verizon's costs associated with provisioning both the high and low frequencies of a single loop in order to provide both data and voice services. Verizon's proposed rate elements for line sharing and line splitting are equivalent because both arrangements require Verizon to provision the high-frequency portion of the loop for CLECs' service offerings. The only difference between these arrangements is that, in a line sharing arrangement, Verizon provides the voice service over the low-frequency portion of the loop, whereas, in a line splitting arrangement, a CLEC provides the voice service.

The FCC identifies five rate elements associated with line sharing: local loops, OSS, cross-connects, splitters, and loop conditioning. Line Sharing Order at ¶ 136. The two rate elements at issue are Line Sharing and Line Splitting OSS, and Splitter-Related Costs. Loop conditioning issues are addressed in Section VI.H (Other xDSL Issues) of this Order.

2. Line Sharing and Line Splitting OSS

a. Overview

In D.T.E. 98-57-Phase III, to facilitate the ordering of line sharing and line splitting arrangements by CLECs, the Department directed Verizon to integrate its OSS enhancements by April 1, 2001. Phase III Order at 23. In that proceeding, Verizon did not propose a rate for its OSS upgrades, but requested a "$0.00 'placeholder' rate for OSS cost recovery, subject to a retroactive true-up." Id. at 130. Verizon, however, now proposes a Line Sharing and Line Splitting OSS rate element of $0.83 for line sharing and line splitting and $0.20 for subloop unbundling, and seeks to apply this rate retroactively to each initial service offering (see RR-DTE-50, Part D). The CLECs challenge these rates on the grounds that they are based upon historic costs rather than forward-looking expenses.

b. Positions of the Parties

i. Verizon

Verizon disputes the CLECs' claim that its Line Sharing OSS rate element recovers historic costs that are already recovered through the application of its ACFs. Verizon states that the FCC allows incumbents to recover the costs for upgrades to its OSS to accommodate line sharing and line splitting (Verizon Reply Brief at 254). Verizon insists that these costs should be recovered only from CLECs that utilize these functions because treating them as "regular costs of business," and thus spreading these costs among all Verizon retail and wholesale customers, unfairly requires those customers who do not use line sharing to subsidize those CLECs that do utilize these specific functionalities (id. at 255). Further, Verizon argues that a five-year recovery period, rather than the ten-year recovery period for general OSS, is appropriate because “line sharing is an interim technology which Verizon MA does not anticipate will last longer than five years” (id.). In addition, Verizon proposes to apply the Line Sharing OSS rate element retroactively to the date of the initial line sharing service offering (RR-DTE-50).

ii. AT&T

AT&T insists that Verizon should not be allowed to recover the costs it incurred to develop new line sharing and line splitting OSS software because those costs are historic costs (ATT Brief at 182). AT&T argues that the Department “previously concluded [in the Consolidated Arbitrations] that it is inappropriate for Verizon to include historic costs in proposed OSS pricing” (id.). According to AT&T, Verizon’s Line Sharing and Line Splitting OSS cost study “presents no evidence that [the costs Verizon seeks to recover] reflect the forward-looking cost of provisioning these services” (id.).

In addition, AT&T contends that Verizon’s Line Sharing and Line Splitting OSS cost study seeks to recover costs already accounted for in Verizon’s general ACFs that are applied to other recurring network elements (id. at 183). AT&T identifies Verizon’s Common Overhead ACF as the loading factor that recovers computer and related personnel costs. Because the line sharing and line splitting OSS charges are for software upgrades, AT&T asserts that these costs are already being recovered through the Common Overhead ACF (id.). AT&T argues that in the Consolidated Arbitrations proceedings, the Department found “that Verizon should not be able to assess specific charges for computing and related support costs that fall within categories of common costs which are recovered through general factors applied in calculating all UNE rates” (id. at 184).

Finally, AT&T notes that, in New York state, Verizon entered into a settlement with CLECs, agreeing that Verizon-New York would not seek to recover this OSS rate element, because, AT&T asserts, Verizon was "apparently aware that its position regarding a separate charge for OSS Cost recovery is weak" (id.). AT&T concludes that Verizon's proposed Line Sharing and Line Splitting OSS charges result in double-recovery of historic computer-related costs and that, if New York end-users are not paying these charges, then Massachusetts end-users should not, either (id.).

iii. CLEC Coalition

The CLEC Coalition attacks Verizon's Line Sharing and Line Splitting OSS cost study on numerous fronts. First, the CLEC Coalition argues that Verizon provides no evidence to show that a competitive bidding process took place or to demonstrate that it implemented a least-cost approach to modifying its OSS software (CLEC Coalition Brief at 141). In addition, the CLEC Coalition points out that Verizon's initially proposed Line Sharing OSS charge of $0.83 per line did not decrease when it added in line splitting demand forecasts, which, according to the CLEC Coalition, "demonstrat[es] the concocted nature of the OSS charge" (id. at 142).

Second, the CLEC Coalition presents a similar argument as AT&T regarding double-recovery of OSS maintenance costs. According to the CLEC Coalition, "it is more appropriate to treat these software maintenance costs as regular costs of business and recover them in the same manner as Verizon recovers its other ongoing OSS costs" (id.).

Third, the CLEC Coalition notes the disparity in the recovery period between Verizon's general OSS charges (ten years) and its Line Sharing and Line Splitting OSS charges (five years), and contends that, "there is no reason to recover the line sharing costs over a different period of time" (id.). By spreading the Line Sharing and Line Splitting OSS charges across a ten-year period, the CLEC Coalition argues that a larger number of CLECs would share the costs (id. at 143).

Fourth, while the CLEC Coalition accepts the FCC's allowance for recovery of historic costs relating to Line Sharing and Line Splitting OSS modifications, it also cites to a reasonability clause in the Line Sharing Order where the FCC stated that it will not permit ILECs to attribute an unreasonable portion of their OSS development costs to the FCC's spectrum unbundling requirements (id., citing Line Sharing Order at ¶ 106). According to the CLEC Coalition, Verizon has failed to provide the necessary support to demonstrate that the costs incurred to upgrade its OSS system for line sharing and line splitting "were necessary and forward-looking" and that Verizon derives no benefit from this upgrade (CLEC Coalition Brief at 143).

Finally, the CLEC Coalition points to the settlement agreement in which Verizon-NY withdrew its OSS charges for line sharing and line splitting. In addition, the CLEC Coalition notes that the Illinois Commerce Commission ("ICC") established a $0.00 rate for Line Sharing and Line Splitting OSS charges. According to the CLEC Coalition, the Illinois commission found in that proceeding[101] that incumbent carrier Ameritech's "estimated demand for line shared loops, particularly those provided by Ameritech's affiliate, is artificially low. It also concurred with concerns that the upgrade may include charges for more than the minimum

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[101] Illinois Bell Telephone Company Proposed Implementation of the High Frequency Portion of Loop (HFPL)/Line Sharing Service Order, ICC No. 00-0393, at 88 (2001); Order on Rehearing, ICC No. 00-0393, at 48 (2001).

upgrade components" (CLEC Coalition Brief at 144, citing ICC No. 00-0393). The CLEC Coalition argues that the same concerns exist in this proceeding.

As a result of the numerous concerns it has regarding Verizon's Line Sharing and Line Splitting OSS charges, the CLEC Coalition recommends that the Department "remove the software maintenance costs and to spread the one-time costs over ten years" (CLEC Coalition Brief at 145). In addition, the CLEC Coalition urges the Department not to allow Verizon to apply these charges retroactively to June 6, 2000 because the OSS modifications were not implemented until April 1, 2001 and CLECs should not have to pay for benefits that they did not receive (id.).

c. Analysis and Findings

Because the FCC states that incumbents may need to modify their OSS systems to increase ordering and provisioning efficiencies relating to line sharing and line splitting, we note that the FCC allows for recovery of historic and ongoing maintenance costs. Line Sharing Order at ¶ 144. Furthermore, while the FCC acknowledges the costs incumbents may incur to modify their OSS systems, the FCC also urges state commissions not to "permit incumbent LECs to attribute an unreasonable portion of their OSS development costs to our spectrum unbundling requirements." Id. at ¶ 106. We note that not only has the FCC identified specific historic OSS costs as recoverable, but also, the Department, in D.T.E. 98-57-Phase III, allowed Verizon to recover its historic costs to enhance its OSS system to better accommodate line sharing and line splitting. Phase III Order at 130.

Regarding AT&T's maintenance expense argument, the Department finds that its reliance on our Consolidated Arbitrations Phase 4-L Order is misplaced. That Order pertained to general OSS costs, not costs related to the FCC's spectrum unbundling requirements. The Department agrees with Verizon that ongoing maintenance expenses are directly attributable and beneficial to CLECs engaging in line sharing and line splitting, and thus should not be subsidized by all carriers through general ACFs, which are applied to all UNEs.

Turning to the CLEC Coalition's argument that Verizon's OSS costs are neither necessary nor forward-looking, we find that the CLEC Coalition offered no evidence in support of its position. Absent evidence of specific functions that are unnecessary, the Department finds the CLEC Coalition's "necessary and forward-looking" argument unpersuasive. Contrary to the CLEC Coalition's assertions, the Department finds that Verizon's OSS enhancements are necessary in order to allow for efficient service ordering and flow-through of line sharing and line splitting requests (see RR-DTE-50). In addition, the Department specifically stated it would not "prohibit Verizon from seeking recovery of its costs to enhance its OSS." Phase III Order at 130. Therefore, Verizon need not prove that the costs incurred to modify its OSS in compliance with the FCC's spectrum unbundling requirements are forward-looking. Regarding Verizon's New York settlement agreement not to recover Line Sharing and Line Splitting OSS costs from CLECs, that agreement, a negotiated outcome, is specific to New York and has no force or relevance in Massachusetts.

Finally, the Department stated in its Phase III Order that it would consider, when Verizon filed a revised tariff and supporting cost study, the appropriateness of applying OSS enhancement charges retroactively to CLECs.[102] Phase III Order at 130. Verizon states that it intends to apply this rate "back to the effective date of each product offering" (RR-DTE-50, Part D). However, the Department agrees with the CLEC Coalition that the recovery of a cost retroactive to the service offering rather than the system implementation date is unreasonable. CLECs did not receive any benefit from Verizon's line sharing and line splitting OSS enhancements prior to its integration and should not be required to pay for services that were unavailable. The Department will allow Verizon to apply this rate retroactive only to April 1, 2001, the date its system modifications were integrated.

Even though we find Verizon's line sharing and line splitting OSS costs to be reasonable as a general matter, the record is unclear concerning demand forecasts. In its initial response to RR-DTE-50, Verizon provided a forecast for line sharing and line splitting demand that it indicated was for Massachusetts (see RR-DTE-50, part M). However, upon further investigation by the Department, Verizon stated that this demand forecast was for the Verizon-

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102 Permitting retroactive application of the OSS charge in this case does not violate the prohibition against retroactive ratemaking, because the prohibition is implicated only after a formal finding that has become final. Boston Gas, D.T.E. 96-50-D, at 8-9 (2001). See, e.g., New England Telephone, D.P.U. 84-238, at 14 (1985) (and cases cited); see also Fitchburg Gas & Electric Light Co., D.T.E. 98-51, at 21 n.8 (1998), Cambridge Electric Light Co., D.P.U. 94-101/95-36, at 19-21 (1995), Berkshire Gas Co., D.P.U. 92-210, at 228, 237 (1993) (and cases cited) (discussing what constitutes retroactive ratemaking). Here, the Department approved Verizon's $0.00 placeholder rate, upon explicit notice to parties in Phase III that the rate was subject to future adjustment. See Phase III Order at 130; D.T.E. 96-50-D, at 9. Further, the finding is just and reasonable under G.L. c. 159 § 14, because Verizon has already incurred the expenses and the CLECs have had the benefit of the OSS enhancements since their integration. See Phase III Order at 130.

East footprint (RR-DTE-50-S). Further clarification of Verizon's demand forecasts is necessary in order for the Department to ensure that Massachusetts' carriers are not reimbursing Verizon for the costs to develop and implement its OSS enhancements across the entire Verizon-East footprint. Accordingly, Verizon is directed to supply, in its compliance filing, additional evidence, such as demand forecasts by state in the Verizon-East footprint, to substantiate its line sharing and line splitting demand forecast for 2002 through 2007 for Massachusetts versus across the Verizon-East footprint.[103] Depending on what that additional data reveal, the Department may modify Verizon's proposed rate.

3. Splitter-Related Costs

a. Overview

The Department approved two types of splitter arrangements[104] and their associated charges for Verizon in D.T.E. 98-57-Phase III:

"Option A": CLEC purchases and installs in collocation cage. Recurring charge is applied to recover network administration and other support necessary for the integration of the equipment into the network.

"Option C": CLEC purchases and Verizon installs, maintains, and supports. A nonrecurring charge is applied to recover the installed expense (material cost x EF&I factor). The recurring charge recovers operating expenses for network maintenance, administration,

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103 See also XI.A (Access to OSS), below.

104 A splitter separates the high frequency (xDSL signals) from the low frequency (voiceband) over copper loops. Splitters are placed at each end of a customer's loop to accomplish this operation. In D.T.E. 98-57-Phase III, Verizon proposed two splitter arrangements labeled "Option A" and "Option C". Verizon did not propose an Option B.

and other support. In this arrangement, the appropriate ACFs are applied to the total installed investment to determine the recurring charge.

In the Phase III Order, the Department stated that, "the general UNE installation factor is appropriate for determining splitter installation costs," and, therefore, it approved the application of the Administration and Support recurring charge to both splitter arrangement options. Phase III Order at 119. In this proceeding, Verizon again submits cost studies for "Option A" and "Option C" splitter arrangements to recover the forward-looking costs attributed to splitter equipment and related services. The CLEC Coalition argues that Verizon inappropriately applies an EF&I factor to both the Splitter Installation and the Administration and Support cost studies.[105] In addition, the CLEC Coalition disputes the applicability of the Administration and Support cost study to the "Option A" splitter arrangement.

b. Positions of the Parties

i. Verizon

Verizon contends that the CLEC Coalition's arguments are unsupported and raise issues previously decided in D.T.E. 98-57-Phase III. According to Verizon, the Department has already approved the application of the EF&I factor to splitter-related costs in Phase III (Verizon Reply Brief at 257). In addition, Verizon asserts that the CLECs have failed to produce any information to refute Verizon's estimated installation costs (id.).

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105 The nonrecurring Splitter Installation charge for splitter arrangement "Option C" seeks to recover the costs Verizon incurs in installing the splitter in its central office space. The recurring Administrative and Support charge seeks to recover the costs associated with Verizon's maintenance, administration, and support of the splitter.

Verizon also maintains that the Department previously approved application of the Administration and Support charge to Option A arrangements, for which the competitor purchases and installs the splitter in its collocation space (id.). Verizon further asserts that the CLECs have failed to demonstrate that these expenses are recaptured in other collocation rate elements (id. at 258).

ii. CLEC Coalition

The CLEC Coalition argues that Verizon's application of an EF&I factor to both the Splitter Installation charge and the Administrative and Support charge is inappropriate. According to the CLEC Coalition, Verizon applies the EF&I factor associated with the digital circuit to the Splitter Installation charge, but in fact, "splitters have little in common with sophisticated pair gain electronics equipment such as digital loop carrier systems and should not be assigned the same EF&I factor" (CLEC Coalition Brief at 128). Further, the CLEC Coalition claims that the costs for line sharing activities and related equipment "were certainly not included in the costs reflected in the EF&I factor" (id.). Citing a Maryland PSC order on line sharing,[106] the CLEC Coalition insists that "the application of an EF&I factor is only appropriately applied to services or elements whose cost experience is reflected or contemplated in the development of the factor" (id. at 129). The application of the EF&I factor to line sharing cost elements, according to the CLEC Coalition, will result in higher rates (id.).

[106] In the Matter of Arbitration of Rhythms Links, Inc. and Covad Communications Company v. Bell Atlantic Maryland, Inc. Pursuant to Section 252(b) of the Telecommunications Act of 1996, Maryland PSC Case 8842, Phase II, Order 76852 at 24 (April 3, 2001) ("Maryland Arbitration Order").

The CLEC Coalition contends that Verizon's assessment of an Administration and Support cost to both "Option A" and "Option C" splitter arrangements is unsupported. According to the CLEC Coalition, the "Option A" arrangement, where a competitor purchases and installs a splitter in its collocation space, is inappropriately assessed this fee because Verizon has not shown that it incurs costs to support a splitter located in CLEC collocation space (id. at 130). The CLEC Coalition argues that it already pays a Building Expense charge[107] for its collocation space, which recovers the costs of equipment support (id. at 131). In addition, the CLEC Coalition maintains that Verizon does not seek to recover support costs for any other type of equipment placed within that collocation space (id. at 132). Furthermore, the CLEC Coalition points out that both the New York and Maryland PSCs have disallowed this rate element for splitters under "Option A" (id. at 133).

The CLEC Coalition also claims that Verizon's Administration and Support charge applied to "Option C" splitter arrangements, where the competitor purchases the equipment but Verizon installs it in its central office space, is inflated because digital circuit support factors are applied to this rate element (id. at 134-135). The CLEC Coalition argues that the use of digital circuit support factors is not representative of the actual costs Verizon would incur (id. at 135). The CLEC Coalition insists that the splitter "contains no active electronic components and requires no power supply" and, therefore, "requires little, if any, maintenance" (id.). In addition, the CLEC Coalition argues that Verizon has not demonstrated that it actually incurs

107 This is a monthly recurring per square foot charge paid by the CLEC based on the amount of space occupied in a collocation arrangement (see Section IX, below).

any support costs related to the splitter that are not otherwise recovered through its other elements, such as Verizon's collocation augmentation charge (id. at 137).

c. Analysis and Findings

The Department granted the CLEC Coalition's motion, which was filed on January 22, 2002, to incorporate portions of the record from D.T.E. 98-57-Phase III. However, we note that the CLEC Coalition could have raised these issues and provided the Department with the opportunity to fully investigate the issues earlier in the evidentiary proceeding. The CLEC Coalition does not make any new arguments or present any new evidence beyond what was contained in the D.T.E. 98-57 record to support its case and to persuade us to change our earlier findings in Phase III on splitter-related costs. When a party seeks to persuade the Department to change its precedent on an issue, simply pointing to the record and arguments in an earlier case in which that policy was developed is insufficient.[108] That is tantamount to filing a late motion for reconsideration, long after the record has closed in the earlier case, and under the Department's standard of review for reconsideration, a party must show previously unknown or undisclosed facts, or show that the Department's decision was based on a mistake or inadvertence. The CLEC Coalition has shown neither. If the Department were to change its policies based on the CLEC Coalition's insufficient demonstration, we would be in effect granting reconsideration of our previous decision without adherence to our longstanding standard of review, not to mention the fact that the CLEC Coalition is procedurally time-barred from asking reconsideration at this time (see 220 C.M.R. § 1.13).

108 Of course, it is also not enough to represent or repackage the same evidence and arguments in subsequent proceedings.

In D.T.E. 98-57-Phase III, although the CLEC Coalition argued that the application of a general EF&I factor to splitter installations is inappropriate and would result in inflated costs, the Department found that in order to be consistent with the various TELRIC analyses, "the general UNE installation factor is appropriate for determining splitter installation costs." Phase III Order at 119. In addition, the Department found that, "a monthly administration and support charge for Option A and Option C is reasonable." Id. at 122. Therefore, lack of new evidence or new arguments on the part of the CLEC Coalition requires the Department to uphold its findings in D.T.E. 98-57-Phase III and approve the splitter cost studies that Verizon has proposed in this proceeding.

H. Other xDSL Issues

1. Wideband Testing System

a. Overview

Wideband Testing System ("WTS") provides the ILEC the ability to test the high band frequency of a shared loop and isolate the reported trouble. According to Verizon, this test capability identifies those troubles for which a field dispatch is not required and provides more efficient and expeditious resolution of reported troubles (Exh. VZ-37, Part B-5, Section 1.1). The WTS consists of three major functional components: (1) Metallic Test Access Units ("MTAUs") [109] are required for each shared line; (2) one Wideband Test Head is required per central office where line sharing is offered; and (3) Broadband Test Operational System

[109] According to Verizon, the MTAU enables opening the circuits to look in both directions, towards the customer and back towards the equipment. This testing can be performed from a remote location. Phase III Order, at 76. The MTAU shelves, with a capacity of 480 circuits, will be installed on the same relay rack upon which the CLEC splitters will be installed.

("OS") costs, which include the cost of capitalized software as well as annual maintenance contract costs.[110]

In the Phase III Order, the Department determined that CLECs should have the option to use the WTS. Phase III Order at 110. In this case, Verizon proposes a mandatory monthly recurring rate of $2.05 per line for the WTS. The CLECs request that the Department maintain its prior determination that the WTS should be an optional charge.

b. Positions of the Parties

i. Verizon

Verizon requests that the Department approve its proposed recurring charge applied to line sharing and line splitting arrangements to recover the cost of WTS equipment purchased to ensure that the loop is capable of supporting the desired services and to isolate any problems to either the data or the voice layer (Verizon Brief at 277). Without this enhanced capability, Verizon states, it will incur greatly increased dispatch costs that would far outweigh the cost of the WTS itself (id.). Verizon states that, although the Department in the Phase III Order found that WTS and the associated charge should be at the CLECs' option, WTS is necessary to provide a fully functional xDSL-compatible loop to the CLECs and, therefore, should not be optional (Verizon Brief at 278; Verizon Reply Brief at 256). Verizon argues that making the WTS charge optional would significantly increase the costs for those CLECs that want to use Verizon's testing (Verizon Reply Brief at 256). According to Verizon, if it is to be held

110 According to Verizon, in order to prevent double recovery, the annual cost factor applied to the Broadband Test OS has been adjusted to exclude the network maintenance component (Exh. VZ-37, Part B-5, Section 1.1).

accountable for service quality standards, it is only fair that it be allowed to use its own testing system and make the testing mandatory (Verizon Brief at 278).

ii. CLEC Coalition

The CLEC Coalition requests that the Department maintain its prior determination that the WTS be an optional charge (CLEC Coalition Brief at 138). The CLEC Coalition argues that Verizon's statement that the charge should be mandatory is without evidence and raises due process concerns because of Verizon's untimely shift in its position on the charge (CLEC Coalition Reply Brief at 31-32). Accordingly, the CLEC Coalition requests that the Department uphold its prior determination that the charge be optional (id. at 32).

c. Analysis and Findings

Verizon fails to present any new evidence or argument to persuade us to modify our prior holding on this issue. As stated above in Section VI.G (Line Sharing and Line Splitting), when a party seeks to persuade the Department to change its precedent on an issue, simply presenting the same arguments and evidence made in the earlier case in which that policy was developed is insufficient and inappropriate because it is tantamount to making a late-filed motion for reconsideration.

In Phase III, CLECs argued that Verizon's WTS is unnecessary and redundant for CLECs that have their own testing capability. Based on the CLECs' argument, the Department determined that CLECs should have the option to use the testing, stating that "CLECs are capable of performing their cost-benefit analysis to determine whether they should ask Verizon to install an MTAU on their shared loops or whether they should forgo Verizon's WTS at the possible risk of increased dispatches in the event of trouble on the line." Phase III

Order at 78. Verizon's argument that if it is going to be held accountable for service quality, it should be allowed to use its own testing system, was considered by the Department in Phase III. As stated above, the Department in the Phase III Order determined that CLECs are capable of performing their own cost-benefit analysis to determine whether they should forgo Verizon's assistance at the risk of increased dispatches in the event of trouble on the line, and thus it is the CLECs that are assuming financial accountability for troubles. Verizon did not present any specific evidence to show that an optional WTS affects its ability to meet service quality standards.[111] Moreover, although Verizon argues that making the charge optional would increase costs for those CLECs that want to use Verizon's WTS, this argument does not support imposing WTS costs on those CLECs who otherwise choose not to use Verizon's WTS. Accordingly, the Department upholds its previous determination for an optional WTS charge. Verizon may file a revised WTS charge in its compliance filing to account for this decision.

2. Cooperative Testing

a. Overview

Cooperative testing is required to be performed on xDSL loops that are being provisioned for CLECs by Verizon. Phase III Order at 111. This testing occurs on the day the loop is to be provided to the CLEC by Verizon and ensures that the line is properly provisioned. Id. The testing consists of the following steps: (1) Verizon provides a "short,"

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111 However, if Verizon can show that lack of mandatory WTS unreasonably affects its ability to meet existing Performance Assurance Plan ("PAP") metrics, the Department may consider modifying such metrics. The PAP proceeding is the proper place to present such evidence.

i.e., grounding on both sides of the cable pair; (2) Verizon removes the short so that the CLEC can perform its diagnostic test; and (3) the CLEC provides a "tone" on the loop. Id. Verizon proposes that CLECs pay a nonrecurring charge of $31.07 for the cooperative testing, whereas, the CLECs insist that Verizon bear the cost, as was determined in Phase III.

b. Positions of the Parties

i. Verizon

Verizon urges the Department to reconsider its decision in the Phase III Order and allow it to charge for cooperative testing (Verizon Brief at 278). Such testing, according to Verizon, goes beyond the normal testing it performs in provisioning loops and is done only at the request of the CLECs, often with a Verizon technician working under the direction of a CLEC technician (id.). Therefore, Verizon states, requiring it to bear the full cost of cooperative testing makes no economic sense (id.). Verizon argues that, if the CLECs do not want cooperative testing, they can install their own equipment and, thus, would not need Verizon's cooperative testing (Verizon Reply Brief at 256). Moreover, Verizon disputes the CLEC Coalition's statement that Verizon's cooperative testing charge is overstated, arguing that the charge is an accurate measure of the time it takes to perform provisioning tasks (id.)

ii. CLEC Coalition

According to the CLEC Coalition, the Department in its Phase III Order determined that no cooperative testing charges should apply (CLEC Coalition Brief at 138). The CLEC Coalition claims that Verizon's provisioning difficulties are the reason it needs to do cooperative testing and that competitors should not have to bear the costs of Verizon's inefficiencies (id. at 139). The CLEC Coalition argues that the need for cooperative testing to ensure that Verizon delivers unbundled loops in compliance with its contractual obligation already forces competitors to incur costs that they should not have to bear (id.). In addition, the CLEC Coalition states that cooperative testing charges should not be applicable in connection with line sharing, which makes use of existing and working lines (id. at 140).

If the Department allows Verizon to charge for cooperative testing, the CLEC Coalition asserts that those charges should be offset by the costs that competitors will incur for testing network elements that Verizon has not properly provisioned (id.). Moreover, the charge should be reduced from what Verizon proposed, since Verizon overstates the average time for forward-looking testing and coordination (id.). The CLEC Coalition also claims that Verizon overstates the occurrence factor to verify dial tone (id.).

c. Analysis and Findings

In the Phase III Order, the Department rejected Verizon's proposed charges for cooperative testing because the Department found that the need for cooperative testing was due to Verizon's difficulties in provisioning stand-alone xDSL loops to CLECs. Phase III Order at 113. As a result, the Department directed Verizon to share in the cost of cooperative testing by absorbing all of its own costs associated with its test, as the CLECs do with respect to their own testing. Id. The Department also found that shifting the costs of this test onto CLECs undermines Verizon's incentive to improve its loop performance. Id.

As found with WTS charges, Verizon has not offered any new evidence or arguments to persuade the Department to change its previous ruling on this issue. Accordingly, the Department upholds its previous ruling.

3. Fiber-Fed DSL-Capable Loop Recurring Charges

a. Overview

Verizon currently provides two copper-based wholesale xDSL technologies: asymmetrical ("ADSL") and high bit-rate ("HDSL") technologies (Exh. VZ-36, at 93-94). Verizon states that it is not planning on deploying copper loops on a forward-looking basis exclusively to support xDSL transmission technologies or the advanced digital services that those technologies can support (id. at 93). Verizon states that, while it is possible to use xDSL technologies on loops equipped with DLC technology, such applications involve the placement of Digital Subscriber Line Access Multiplexers ("DSLAMs")[112] at the remote terminal rather than at the central office. Verizon states that, in such cases, however, the use of xDSL technology is limited to the copper distribution portion of the loop; the technology would not be used on the fiber feeder facilities between the terminal and the central office. Therefore, even in such applications, the use of the technology would still be limited to copper cables (id. at 93-94 n.20).

The issue here is whether Verizon is required to offer, and tariff rates for, DSL-capable fiber-fed loops. AT&T argues that DSL over fiber-fed loops is technically possible and legally required; whereas, Verizon argues that it is not.

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[112] A DSLAM is a device used to split data and voice traffic and route each to the appropriate destination. See UNE Remand Order at ¶ 175 n.324.

b. Positions of the Parties

i. Verizon

Verizon claims that AT&T's argument that it must propose costs for fiber-fed DSL-capable loops is inappropriate, illogical, and based on a misrepresentation of the FCC's ruling and a misunderstanding of Verizon's proposal in this proceeding (Verizon Reply Brief at 251-252). Verizon argues that, contrary to AT&T's argument, the FCC has never stated that it is technically feasible to provide DSL over fiber-fed loops and, in fact, the FCC recently rejected AT&T's claim in the Arkansas/Missouri 271 Order[113] (id. at 252). In addition, Verizon argues that in the Line Sharing Reconsideration Order, the FCC did not conclude that fiber-fed DSL-capable loops are feasible, as AT&T asserts, but rather reaffirmed that the high frequency portion of the loop is limited by technology and is available only on copper (id.). Verizon, therefore, claims that it has no obligation at this time to provide fiber-fed DSL-capable loops or to price such an offering in this proceeding (id.). Moreover, Verizon indicates that the issue of fiber-fed DSL-capable loops is currently being addressed by the Department in the ongoing Phase III case, and AT&T's attempt to bring this issue into this proceeding should be rejected (id. at 253).

113 In the Matter of Joint Application by SBC Communications, Inc., Southwestern Bell Telephone Company, and Southwestern Bell Communications Services, Inc. d/b/a Southwestern Bell Long Distance, Pursuant to Section 271 of the Telecommunications Act of 1996 to Provide In-Region, InterLATA Services in Arkansas and Missouri, CC Dockey No. 01-194, Memorandum Opinion and Order, FCC 01-338 (rel. November 16, 2001) ("Arkansas/Missouri 271 Order").

ii. AT&T

AT&T contends that, despite the FCC's requirement and Verizon's own proposal for providing DSL-capable fiber-fed loops, Verizon claims that there is no such thing as a DSL-capable fiber-fed loop and fails to propose a recurring charge for it (AT&T Brief at 178). AT&T argues that DSL over fiber-fed loops is indeed technically possible (AT&T Reply Brief at 119). In fact, AT&T notes that Verizon announced in the Phase III proceeding that it is beginning to provide such capability (id.). Hence, AT&T argues that there is no sound basis for Verizon's failure to propose recurring charges for fiber-fed DSL loops because DSL over fiber is technically feasible and will be provided within the next five years (AT&T Brief at 180).

Moreover, AT&T claims that Verizon contradicts itself by saying on the one hand that DSL is a purely copper-based technology and on the other hand requesting that the Department defer its decision on the issue in this case because the issue is being considered in Phase III (id.). More importantly, AT&T contends, Verizon's own internal documents demonstrate that DSL can be provisioned over fiber-fed lines (id. at 181). AT&T indicates that Mr. Donovan, AT&T's and WorldCom's witness, explained that a line card now available from Alcatel makes it possible for a customer receiving service via IDLC on fiber feeder to obtain DSL service (AT&T Reply Brief at 120). According to AT&T, the line card performs both the line splitting and DSLAM functions: (1) it takes the high-frequency data portion of the copper distribution signal and turns it into packets of data stream that can be transmitted on the existing fiber feeder; and (2) it transmits the voice signal over the existing IDLC (id.).

Because Verizon failed to propose charges for fiber-fed DSL loops, AT&T proposes a monthly recurring charge of $11.28 for a fiber-fed two-wire DSL loop that covers the cost of the loop, the cost of upgrading the RT to accept ADSL line cards, and the fiber feeder capacity for both the data and voice signals (AT&T Brief at 179). AT&T also proposes a monthly recurring charge of $12.65 for a DSL-capable HDSL four-wire loop and a monthly recurring charge of $32.23 for a DSL equipped HDSL four-wire loop (id.).[114] AT&T claims that its proposed charges are undisputed and should be adopted by the Department (AT&T Reply Brief at 119).

c. Analysis and Findings

AT&T claims that Verizon is not only required by the FCC to provide xDSL-capable-fiber-loops but has in fact offered to provide xDSL-capable fiber-loops in Phase III. AT&T quotes the FCC's Line Sharing Reconsideration Order to support its claim that Verizon has a legal obligation to propose charges for fiber-fed xDSL-capable loops (see Exh. ATT-28, at 16-21). Although AT&T correctly points out that the FCC has held that an ILEC's obligation to provide line sharing (or in the case of an ILEC's obligation to provide stand alone xDSL-capable loops) is not limited to copper loops but extends to fiber-fed loops, AT&T fails to point out that the FCC recognizes that there are existing technical barriers. The FCC acknowledges that xDSL service is limited by technology (i.e., it is a copper-based technology). The FCC states that it is access to fiber-fed loops that ILECs are obligated to provide to the CLECs, not a physical unbundling of the high frequency portion of fiber-fed

114 According to AT&T, an HDSL-equipped loop is a DS1 circuit; whereas an HDSL-capable loop is a unique Verizon tariff offering, and its price differs from the price of a DS1 loop (Exh.ATT-25, at 65).

loops. See Line Sharing Reconsideration Order at ¶ 10. According to the FCC, "access" to an unbundled network element refers to the means by which requesting carriers obtain an element's functionality in order to provide a telecommunications service. Local Competition Order at ¶ 269. Verizon is currently providing CLECs with such "access" through a line station transfer (i.e., to migrate a DLC-served customer onto an all-copper loop) or through RT collocation combined with subloops, so that CLECs can provide xDSL services when loops are served over fiber. Although the FCC illustrates a few methods by which such access can be gained, such as a line station transfer, remote terminal collocation combined with a subloop element, or dark fiber, etc., it does not mandate any particular means, because solutions largely turn on the inherent capabilities of the equipment that incumbent LECs have developed and are planning to deploy in remote terminals. See Line Sharing Reconsideration Order at ¶¶ 11-13.

The FCC is still considering the issue regarding what features, functions, and capabilities are created by deployment of new network architectures that give fiber-fed loops the capability of providing xDSL service (see RR-DTE-86-S). The FCC has sought comments on whether the deployment of new network architectures, such as NGDLC and line cards that perform both splitter and DSLAM functions, necessitates any modification to, or clarification of, the FCC's rules concerning subloops, as well as those pertaining to line sharing. Advanced

Services Fifth Further NPRM[115] at ¶¶ 82, 118, 122-124. In the Line Sharing Reconsideration Order, which was issued subsequent to the Advanced Services Fifth Further NPRM, the FCC stated that it is still considering the extent of ILEC obligations concerning methods of access to fiber-fed loops for xDSL service. See Line Sharing Reconsideration Order at ¶¶ 13, 25, 64.

In addition, the United States Court of Appeals for the D.C. Circuit recently issued an opinion that directs the FCC to undertake a more focused examination of the Act's unbundling obligations.[116] The FCC also is currently examining its unbundling framework, including line sharing rules, in its UNE Triennial Review, which is currently open for public comment.[117] The FCC, in a press release[118] concerning the Court's decision, states that it will be exploring

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115 In the Matters of Deployment of Wireline Services Offering Advanced Telecommunications Capability and Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Order on Reconsideration and Second Further Notice of Proposed Rulemaking in CC Docket No. 98-147, and Fifth Further Notice of Proposed Rulemaking in CC Docket No. 96-98, FCC 00-297 (rel. August 10, 2000) ("Advanced Services Fifth Further NPRM").

116 United States Telecom Ass'n v. FCC, Nos. 00-1012 and 00-1015 (D.C. Cir. May 24, 2002).

117 In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, CC Docket No. 01-338, Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket No. 96-98, and Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket No. 98-147, Notice of Proposed Rulemaking, FCC 01-361 (rel. December 20, 2001) ("UNE Triennial Review NPRM"). The FCC initiated the UNE Triennial Review NPRM to re-examine its policies on UNEs. The NPRM seeks to identify more precisely how ILECs must provide competitors access to their ubiquitous networks.

118 See Statement of FCC Chairman Michael Powell on the Decision by the Court of Appeals for the District of Columbia Regarding the Commission's Unbundling Rules (May 24, 2002) at: http://www.fcc.gov/Speeches/Powell/Statements/2002/stmkp212.html.

in the coming months many of the issues that the Court raised in its opinion as it evaluates the record in its UNE Triennial Review NPRM Proceeding.

At the same time that the FCC considers these issues, the Department has been conducting its own examination in a continuation of D.T.E. 98-57-Phase III. That investigation stems from findings we made in the September 29, 2000 Phase III Order, in which the Department directed Verizon to file a proposed tariff that would enable CLECs to place, or have Verizon place, CLEC-purchased line cards in Verizon's DLC electronics at the RT and to file a tariff for feeder subloops. Phase III Order at 87. In its Phase III-A Order, the Department allowed Verizon also to file an alternative unbundled packet-switching proposal wherein Verizon would own, deploy, install, and maintain the line cards at the RTs. Phase III-A Order at 43-45. Verizon filed its proposed tariffs for both alternatives on March 12, 2001.

As directed by the Department in the Phase III-A Reconsideration Order, the issue of Verizon's obligations for provisioning and tariffing of fiber-fed loops is being investigated in the Phase III docket. Thus, we agree with Verizon that it has no obligation, with respect to this TELRIC proceeding, to tariff charges for fiber-fed DSL-capable loops. That issue is being addressed in Phase III. Accordingly, the Department rejects AT&T's proposal for recurring rates for fiber-fed DSL-capable loops.

4. Loop Conditioning and Qualification

a. Overview

Loop conditioning charges seek to recover the costs of removing load coils and bridge taps from both aerial and underground copper cables to provide CLECs with DSL-compatible loops. To determine whether a particular copper loop can support DSL services or if it needs conditioning, the CLECs must perform loop qualification by accessing Verizon's mechanized loop qualification database. When the mechanized database or CLEC-requested information is not available, Verizon will manually qualify the loop. When loop information cannot be determined from either the mechanized database or the manual qualification process, Verizon will perform an engineering query to establish whether the loop can support DSL.

In the D.T.E. 98-57-Phase III proceeding, the Department denied Verizon cost recovery for conditioning non-Carrier Serving Area ("CSA")[119] compliant loops and for loops greater than 18,000 feet. However, the Department clarified that Verizon is entitled to recover its loop conditioning costs when a CLEC requests conditioning of a CSA-compliant loop fully capable of supporting DSL services. Phase III-B Clarification Order at 2. The Department denied Verizon cost recovery for loop qualification.

In this proceeding, Verizon is proposing nonrecurring charges to recover its costs for conditioning loops greater than 18,000 feet, and for performing manual loop qualification and engineering queries. The CLECs argue that Verizon should not be allowed to recover these costs because they are based on Verizon's existing network and not based on the network assumptions adopted for all other UNE rates.

Specific to Verizon's loop conditioning charge, the CLECs argue that Verizon has overestimated the work times associated with loop conditioning in its cost study. Regarding Verizon's proposed manual loop qualification and engineering query charge, AT&T alleges

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[119] In order for DSL services to be uninterrupted, CSA standards require no more than 2,500 feet in total bridged tap on each loop and no single bridged tap longer than 2,000. See Phase III-A Reconsideration Order at 30.

that Verizon does not provide nondiscriminatory access to its mechanized loop qualification database, resulting in unnecessary manual qualifications and engineering queries.

b. Positions of the Parties

i. Verizon

Verizon claims that its proposed charges for loop conditioning and loop qualification are consistent with economic principles and with previous Department Orders and FCC precedent (Verizon Brief at 267). To begin, Verizon states that the CLECs' argument that loop conditioning ought to be recovered on a recurring basis violates FCC rulings and principles of cost-causation. According to Verizon, "the FCC has made clear that 'the costs incumbents impose on competitors for loop conditioning are [to be] in compliance with [its] pricing rules for non-recurring costs'" (id. at 271, citing UNE Remand Order at ¶ 194) (emphasis in original).

Next, Verizon states that the Department's Phase III Order is no longer applicable in this proceeding. Verizon points out that in the Phase III Order, the Department stated it would allow the recovery of loop conditioning if the network assumptions contained copper feeder. In this proceeding, because its network assumptions include copper feeder, Verizon argues that the Department should allow it cost recovery for loop conditioning (Verizon Brief at 269).

Furthermore, Verizon contends that if the Department assumes 100 percent fiber feeder on loops over 18,000 feet, then it should also assume that loops over 18,000 feet cannot be used to provide DSL services. However, Verizon states that if the Department requires it to provide DSL-capable loops in excess of 18,000 feet, then "it must be allowed to charge for conditioning them" (id. at 270). According to Verizon, it does not provide DSL services on loops over 18,000 feet because at that length, DSL speeds slow considerably so that the difference between DSL and dial-up service is not enough to justify the costs (id., citing Tr. 3, at 474-475). Verizon claims that CLECs would request loop conditioning for loops greater than 18,000 feet, regardless of the marginal benefit, since they would not be assessed any costs, and, according to Verizon, "the conditioning costs are very high, particularly for longer loops" (Verizon Brief at 270).

Regarding the cost study, Verizon argues its loop conditioning cost study is based on surveys of its experienced personnel, whereas the CLECs' have proposed unsubstantiated and "unrealistic time estimates" to conduct loop conditioning (id. at 271). Verizon claims that the CLECs have "grossly understated [line] conditioning costs by eliminating necessary work steps, underestimating the time for the work steps[,] . . . and generally failing to appreciate the conditions under which [line] conditioning activities are performed in the real world" (id.).

Verizon also alleges that the CLEC's argument to reduce the conditioning costs by conditioning loops in batches of 25 or 50 is without merit. According to Verizon, conditioning additional loops without the guaranteed use for data services by CLECs would render those loops useless for voice services, "degrade the quality of service available on Verizon MA's network and subject the network to the risk of major failures" (id. at 272). In addition, Verizon states that it has rarely experienced a request for more than one loop greater than 18,000 feet within the same area (id. at 272-273, citing Tr. 3, at 470-471). Furthermore, Verizon claims that the CLECs' assumptions of the availability of bundles of spare capacity for conditioning are incorrect, and that even if it were possible to bundle its spare capacity, Verizon argues it would be left with no spare capacity for voice service, thus hindering its ability to meet future demand (Verizon Brief at 273). Additionally, Verizon contends that the CLECs' proposed batch conditioning would result in excessive costs being absorbed by Verizon to condition loops "that no one has requested and that are not necessary to provide anyone with service," and which would result in "unnecessary and wasteful work that will degrade voice quality" (id. at 274).

Regarding loop qualification, Verizon argues that the Department previously found that all the information necessary to qualify a loop is available to the CLECs through Verizon's enhanced loop qualification database (id. at 275, citing D.T.E. 99-271, at 294). In addition, Verizon points out that the FCC only requires incumbents to "provide requesting carriers the same underlying information that the incumbent LEC has in any of its own databases or other internal records" and that in reviewing Verizon's Massachusetts 271 application, the FCC concluded that Verizon provides CLECs with nondiscriminatory access to its OSS in order to qualify loops for DSL services (Verizon Brief at 276, citing UNE Remand Order at ¶¶ 427, 428; Verizon Brief at 275, citing Massachusetts 271 Order at ¶ 60). According to Verizon, its database now contains 100 percent of the loops for all COs with collocation, and Verizon now provides access to its Loop Facility Assignment and Control System database at no charge (Verizon Reply Brief at 249).

Although the CLECs allege that it is inappropriate to charge for unnecessary manual loop qualification, Verizon states that to include every detail of information for every loop in its database "would be a massive and cost-prohibitive effort" (Verizon Brief at 276, citing Exh. VZ-17, at 55-56, Exh. VZ-18, at 68). Because the CLECs may request additional information not included in its database, Verizon offers two types of manual loop qualification and maintains that "the CLECs offer no reason to question the validity of these charges" (Verizon Brief at 277). Verizon insists that it "provides CLECs with all the information it provides for itself; if the CLECs require access to more than that information, they must pay for it" (Verizon Reply Brief at 251).

Finally, Verizon responds to the CLECs' proposal of being charged on a "per query" basis as being unworkable. According to Verizon, not only would a "per query" charge (rather than a base charge for unlimited access) be inefficient, but also Verizon has no means to monitor the number of times a CLEC accesses its database (id. at 250).

ii. AT&T

AT&T argues that Verizon's claim that it should be allowed to recover loop conditioning costs is "still based on the inefficiencies of its embedded network and is not TELRIC compliant" (AT&T Brief at 185). First, AT&T states that even though Verizon includes copper loops in its forward-looking network, these copper loops would not need conditioning to remove load coils and bridged taps. AT&T maintains that a forward-looking network would not deploy cable runs with copper loops in excess of 18,000 feet and points out that Verizon's cost study concurs with this assumption (id.).

In addition, AT&T claims that had Verizon followed its own engineering guidelines, it would have eliminated excessive bridged taps beginning in 1972 and load coils since 1980, thus eliminating the need for loop conditioning on loops put into service after 1980 (id. at 186). AT&T insists that Verizon should not be allowed to recover the costs "related to its current, inefficient, embedded network – not expenses that Verizon would incur in connection with a forward-looking network" (id.). However, should the Department allow Verizon to recover loop conditioning costs, AT&T urges that these costs be recovered on a recurring basis. AT&T claims that loop conditioning benefits both the network and its users, and "that all who benefit for such work will share that cost proportionately" (id. at 187).

Regarding Verizon's proposed loop qualification charge, AT&T claims this rate is excessive because it is based on "assumptions that reflect[ ] antiquated, inadequate and backward looking methods for storing and accessing loop information" (id.). Specifically, AT&T alleges that Verizon's assumptions do not comply with FCC requirements and do not provide the information needed by CLECs. First, AT&T contends that Verizon's database is limited to providing loop length information and qualifying DSL-compatible loops, but, argues AT&T, this is "far from adequate" (id. at 188). Despite the FCC requirement that ILECs provide CLECs with nondiscriminatory access to the same loop information that it uses, AT&T argues that Verizon unilaterally determined that CLECs need nothing more than loop length information, and, AT&T insists, such filtering of information is exactly what the FCC prohibits (id. at 188-189).

Second, AT&T alleges that, "at the same time that Verizon proposes for CLECs an inadequate pre-qualification database, it uses for itself a superior tool for determining whether the loop is qualified for DSL" (id. at 189). Verizon uses the Celerity system from Teradyne, and according to AT&T, a comparison of this system with what the CLECs use shows the superiority of Celerity (id. at 191). AT&T accuses Verizon of purchasing this system to give Verizon an advantage when selling to end-users, with the additional benefits of cost and efficiency savings (id. at 192). According to AT&T, Celerity accurately qualifies millions of lines in hours and develops a database that separates lines based on whether they are qualified for immediate installation, require conditioning, or are disqualified, whereas the system used by CLECs can only qualify a maximum of six lines per hour (id.). AT&T argues that "Verizon cannot limit its responsibilities to CLECs by claiming that the Teradyne tool will only be used in a few offices in the former GTE territory and by implication is inapplicable to the Massachusetts market" (id.). Because of the FCC's nondiscriminatory access requirements, AT&T insists that the Department should require Verizon to provide CLECs with equal access to its Celerity system, and that "anything less would be discriminatory, because the tool Verizon provides for use by CLECs in Massachusetts does not provide real time testing information to CLECs[,] . . . nor does it have the ability to detect CO splitters and load coils" (id.).

iii. CLEC Coalition

The CLEC Coalition recommends that the Department uphold its previous determination that, in a forward-looking network, loop conditioning would not be necessary. In addition, the CLEC Coalition states that Verizon's loop conditioning charges are inconsistent with TELRIC pricing principles for the following three reasons: (1) the proposed conditioning charges do not reflect an efficient, forward-looking network; (2) the proposed nonrecurring conditioning charges, in addition to the recurring loop charges, result in Verizon's over-recovery of its costs; and (3) the proposed conditioning charges do not reflect efficient task times.

First, the CLEC Coalition asserts that a forward-looking network would not contain load coils and bridged taps if the network is designed to meet the CSA guidelines that have been in place for over two decades (CLEC Coalition Brief at 151 n.702). In fact, the CLEC

Coalition alleges, Verizon's proposed loop cost study reflects a network that does not need load coils and bridged taps. Therefore, according to the CLEC Coalition, Verizon can only propose loop conditioning charges if Verizon assumes a network in its conditioning cost study that differs from its forward-looking network proposed in its loop cost study (id. at 152).

The CLEC Coalition points to the 2001 Maryland Arbitration Order rejecting loop conditioning charges based on the assumption that copper loops would not exceed 18,000 feet in a forward-looking network, and, using a similar rationale, the CLEC Coalition urges the Department to affirm the Phase III Order by "not [permitting] Verizon to 'tack back and forth' between different network assumptions based solely upon whether the particular network assumption produces higher rates for Verizon" (id. at 153).

Second, the CLEC Coalition claims that the imposition of both Verizon's proposed recurring loop charges and its nonrecurring conditioning charges results in double recovery. The CLEC Coalition states that Verizon assumes a forward-looking network in its recurring loop cost study, which results in loops over 18,000 feet to be fiber fed. The purchase of a loop priced from Verizon's proposed recurring cost study, according to the CLEC Coalition, results in a CLEC "paying for a loop that should already be fully capable of providing DSL service" (id. at 154). However, the CLEC Coalition points out that for the loop conditioning cost study, "Verizon assumes that these same loops exceeding 18,000 feet in length were made of only copper, and therefore would probably contain voice-enhancing equipment that would need to be removed" (id. at 155). The CLEC Coalition alleges that these differing network assumptions violate the principle of forward-looking cost minimization and "create[ ] a significant risk of double-counting," which Verizon has not disproved (id.).

Third, the CLEC Coalition charges that Verizon's proposed loop conditioning charges are a result of "highly inefficient work times and manual procedures as well as Verizon's own failures in updating databases or modernizing its plant consistent with current network design standards" (id. at 165). As an example, the CLEC Coalition states that it should take 9.6 minutes to remove a pair of load coils from an underground cable in a manhole and approximately ten minutes to remove bridged tap, significantly shorter times than what Verizon proposes (id. at 165-166).

Additionally, the CLEC Coalition states that the Department should reject Verizon's proposal to charge for adding electronics, such as repeaters, to provision ISDN-type service over longer all-copper loops based on the same reasoning as for loop conditioning. To begin, the CLEC Coalition insists that Verizon's recurring loop costs already take into account the costs for required electronics. Although ISDN electronics are required for longer copper loops, the CLEC Coalition notes that the recurring loop cost study assumes fiber in its forward-looking network and insists that Verizon should not be allowed to apply inconsistent network assumptions to both its recurring and nonrecurring cost studies (id. at 170-171). Accordingly, the CLEC Coalition recommends that the Department reject Verizon's proposed Add Electronics (Repeater) charge.

Regarding loop qualification, the CLEC Coalition urges the Department to adhere to its findings in its Phase III Order. Again, the CLEC Coalition points to Verizon's forward-looking network assumptions for copper loops less than 10,000 feet in length, which would not require load coils or bridged taps, and, thus, would not need loop qualification. Because Verizon failed to follow its own engineering guidelines that were in place for twenty years, the

CLEC Coalition argues that it should not be required to pay for Verizon's failures (id. at 173-174).

c. Analysis and Findings

In the Consolidated Arbitrations proceeding, the Department approved Verizon's proposed forward-looking network assumption of 100 percent fiber feeder for its recurring loop cost studies in the Phase 4 Order. However, when Verizon sought to change its network assumption to 90 percent copper feeder for its nonrecurring cost study, the Department rejected the differing network assumptions in the Phase 4-L Order, stating that, "there is no reason to apply a different set of technology assumptions to the development of [non-recurring charges] from recurring charges" and that to do so would result in "the higher recurring costs associated with all fiber feeder and the higher [non-recurring charges] associated with a network composed primarily of copper feeder." Phase 4-L Order at 19.

Likewise, in the D.T.E. 98-57 Phase III proceeding, we rejected the use of copper loops in modeling the network for Verizon's proposed line sharing UNE rates and based our loop conditioning and qualification findings on Verizon's forward-looking network assumption used in the Consolidated Arbitrations proceeding of 100 percent fiber feeder. See Phase III Order at 104. Because loop conditioning and qualification are relevant only to copper loops, the Department stated that "loop qualification and loop conditioning would not be necessary in a network with all fiber feeder." Id. The Department conceded that copper plant would exist in the distribution portion of the loop over which line sharing would take place even in a network of 100 percent fiber feeder, but concluded that it "does not require any line qualification or conditioning." Id.

Although Verizon argued that the FCC allowed for recovery of loop conditioning and qualification costs, the Department disagreed. The Department stated that:

> [W]e believe that the FCC's directives related to recovery of loop qualification and conditioning costs are only relevant to states that have assumed copper feeder for purposes of calculating TELRIC. The FCC has not directed states to assume copper feeder in calculating TELRIC, and, without such a directive, it would be illogical for the FCC to mandate the recovery of costs that are relevant only to a network assumption that may not have been approved in a particular state . . . . If the FCC in fact were to require the Department to assume the use of copper feeder for calculating TELRIC for line sharing, we would allow Verizon to charge for both loop qualification and loop conditioning.

Phase III Order at 105-106.

Consequently, because Verizon assumed a network consisting of 100 percent fiber feeder in the Consolidated Arbitrations proceeding, the Department denied Verizon cost recovery for loop conditioning and qualification in the Phase III Order. Thereafter, Verizon filed a motion for reconsideration of the Phase III Order. In the Phase III-A Reconsideration Order, the Department affirmed its rejection of Verizon's use of copper feeder in its earlier decision, stating that "network assumptions that are inconsistent with assumptions we used in earlier Department Orders on the development of TELRIC rates must be rejected. To rule any other way invites Verizon to 'cherry pick' between copper and fiber network assumptions to propose the model design most advantageous to it, at the expense of competition." Phase III-A Reconsideration Order at 35-36 (citations omitted).

The Department found further support for its decision in Verizon's Phase III Reply Brief, which stated that "[i]f a fiber-based network is assumed for cost development purposes, then the lines hypothetically would not be equipped with load coils and bridged tap, and the ILECs would not be able to recover their costs of removing them from the shared line."

Phase III-A Reconsideration Order at 36, citing Verizon Reply Brief at 9. Regarding Verizon's loop qualification charges, we pointed out that by Verizon's own admission, CLECs did not need to know the actual length and gauge of a loop in provisioning xDSL because Verizon meets "at a minimum, standard [resistance] design or in some cases Carrier Serving Area Design Standards." Phase III-A Reconsideration Order at 36, citing Exh. VZ-MA-4, at 68.

In the Phase III-B Clarification Order, the Department provided further clarification of its loop conditioning findings. Specifically, we stated that Verizon is entitled to recover its costs to condition CSA-compliant loops unless a CLEC demonstrates that the loop is not capable of supporting DSL services. Phase III-B Clarification Order at 2. The Department stated that Verizon's responsibility is to provide CLECs with DSL-capable loops; therefore, if a CLEC-requested loop is CSA-compliant and capable of supporting DSL services, and the CLEC requests loop conditioning nonetheless, then Verizon is entitled to recover its conditioning costs.

In this proceeding, the Department finds that a forward-looking network would employ a mix of approximately 41.2 percent copper and 58.8 percent fiber. See, above, Section VI.B.3 (Technology Mix for Feeder). Verizon argues that its proposed loop conditioning and qualification charges are consistent with the Department's findings in the Phase III Order, because the Department stated that we "would allow Verizon MA to charge for line conditioning if network assumptions included the use of copper feeder" (Verizon Brief at 269) (emphasis in original). Verizon, however, misconstrues our earlier findings. In the Phase III Order, the Department referenced the FCC's Line Sharing Order, and stated that only "if the

FCC in fact were to require the Department to assume the use of copper feeder for calculating TELRIC in line sharing, we would allow Verizon to charge for both loop qualification and loop conditioning." Phase III Order at 106. Although in this proceeding a different percentage of copper feeder is included in the network assumptions from what Verizon proposed, the record still shows that an efficiently designed forward-looking network would not consist of copper loop lengths in excess of 18,000 feet, so that loop conditioning would not be necessary (see Exh. ATT-VZ 4-25, Att. B).

To allow Verizon to recover loop conditioning costs on copper loops greater than 18,000 feet would ignore our findings in this proceeding regarding Verizon's forward-looking network. In addition, to do so would be inconsistent with our previous orders. The Department has already determined in the Phase 4-L Order, and reiterated in the Phase III-A Reconsideration Order, that a mismatching of network assumptions between recurring and nonrecurring costs could result in Verizon choosing the network design that is most advantageous to itself for cost recovery. Verizon cannot base its cost studies on a hypothetical network and then seek to recover its costs based on existing network design. Thus, the Department denies Verizon's request to be allowed to charge for conditioning loops greater than 18,000 feet, since those loops would be fiber in a forward-looking network.

For loops less than 18,000 feet, the Department will maintain its policies established in D.T.E. 98-57-Phase III. Consistent with our findings in the Phase III-B Clarification Order, the Department will not permit Verizon to recover loop conditioning costs on loops that do not comply with CSA standards. However, when a loop meets CSA standards and a CLEC still requests to have the load coils and bridged taps removed, the Department finds that the requesting CLEC is responsible for the loop conditioning charges unless it can demonstrate to the Department that the CSA-compliant loop cannot support DSL. The Department affirms these findings to ensure that Verizon does not incur unnecessary costs to condition loops that are fully capable of supporting DSL services. Phase III-B Clarification Order at 2. Therefore, the Department only approves the application of loop conditioning charges in situations when a CLEC requests conditioning on a CSA-compliant loop of less than 18,000 feet.

We find that the CLEC Coalition has not provided any new evidence to support its claim that Verizon has overestimated its loop conditioning work time estimates. As we stated in Section VI.G.3 (Splitter-Related Costs), the CLEC Coalition's inclusion of data from the 98-57 Phase III proceeding should have been raised earlier in the proceeding to allow the Department adequate time to supplement the record from that proceeding and to review the evidence against Verizon's work time estimates (see CLEC Coalition Brief at 165-166). Without such opportunity, the Department cannot validate (e.g., through cross-examination of the witnesses), and therefore cannot accept, the CLEC Coalition's testimony to refute Verizon's work time estimates. Because Verizon's loop conditioning cost study is part of its NRCM, our findings with respect to the NRC task times in Section X.D (Task Time Methodology) apply here. Verizon shall provide supporting documentation that demonstrates its compliance with this directive.

The CLECs' request to require loop conditioning for multiple loops at the same time is wasteful. The Department agrees with Verizon that this would result in unnecessary costs for Verizon by removing load coils and bridged taps from loops that may never support xDSL services and which may potentially degrade the voice services over those loops. Therefore, the

Department denies the CLECs' requests to require Verizon to condition multiple loops at one interval.

The Department also rejects Verizon's proposed charge to add electronics for ISDN-type services. In the hypothetical forward-looking network we adopt in this proceeding, there is no copper feeder in excess of 9,000 feet. Thus, under this hypothesis, it would be unnecessary for Verizon to add electronics to enhance the capabilities of longer copper loops. Moreover, allowing Verizon cost recovery for this service would be inconsistent with our hypothetical network and would result in a mismatching of network assumptions.

Regarding loop qualification, the Department denies Verizon's proposed charges. Once again, we emphasize that our hypothetical network construct results in copper feeder less than 9,000 feet, which is fully capable of supporting xDSL services. As a result, CLECs do not need to qualify these copper loops.

However, AT&T raises an important issue regarding nondiscriminatory access to Verizon's loop qualification systems. In approving Verizon's 271 application for Massachusetts, the FCC found that CLECs were provided nondiscriminatory access to Verizon's "OSS pre-ordering functions associated with determining whether a loop is capable of supporting xDSL advanced technologies." Massachusetts 271 Order at ¶ 53. Following this approval, AT&T maintains, Verizon placed an order for Celerity, a newer and better system for qualifying its loops developed by Teradyne (Exh. ATT-28, exh. JCD-2.1). Furthermore, AT&T notes that the UNE Remand Order states that "to the extent that Verizon or its affiliate has access to the information available from the Teradyne tool, Verizon must also provide non-discriminatory access to a requesting competitor in the same format" (AT&T Brief at 192).

The Department finds that AT&T misinterprets the UNE Remand Order. Based on the record before us, the Department finds that the use of Celerity is limited to the "millions of lines located in the former-GTE region" (Exh. ATT-28, exh. JCD-2.1). The record also indicates that this system is not deployed in Massachusetts. Thus, because Verizon's personnel do not have access to the Celerity system for qualifying loops in Massachusetts, the Department finds that AT&T's position is without merit. But, if Verizon upgrades its loop qualification system in Massachusetts, then Verizon must provide unencumbered access to that system in order to comply with the FCC's UNE Remand Order.

VII. SWITCHING

A. Positions of the Parties

1. Verizon

a. Overview

Verizon's local switching UNEs consist of line ports, trunk ports, local switch usage (terminating and originating), reciprocal compensation, and features (e.g., three-way calling) (Exh. VZ-36, at 130). Verizon's proposed switch UNE costs assume digital switching with 57 percent Lucent 5ESS and 43 percent Nortel DMS-100 technologies (id.). Verizon further assumes that 25 percent of the lines are provisioned on integrated DLC GR-303 peripherals and that 75 percent of the lines are provisioned on analog line ports with UDLC peripherals (id.). Verizon's switch cost study assumes the existing wire center locations, and Verizon computes its proposed cost of material investment using the SCIS model developed by

Telcordia (previously Bellcore) (id. at 131-132). Model inputs are based on existing switches, adjusted to be forward-looking; vendor list prices are built into the SCIS; and vendor discounts are entered as inputs when the program is run (id. at 133).

Verizon's switching cost calculations also depend on other factors, such as assumptions about forecast demand for total busy hour minutes of use ("MOU"), call completion ratios, the duration of the planning cycle, and utilization, i.e., the working capacity of the switch as a percentage of total installed capacity (Exh. VZ-37, Part C). Verizon converts total material investment, yielded as outputs by the SCIS model, into an MOU basis in several steps to incorporate adjustments for factors such as non-conversation time, a busy hour to annual conversion factor, and a RTU factor (id., Part C-2, Workpaper, Part C-3, Workpaper). The local switching usage MOU costs apply to intra-switch calls as well as to inter-switch calls (Exh. VZ-36, at 159).

Tandem switching covers trunk-connect facilities, basic switch trunk function, and the functions set in tandem switches (id. at 163-164). A tandem switching element consists of trunk ports and usage, with trunk ports being either dedicated or common (the latter are recovered on a per MOU basis (id. at 164). Verizon's cost study is based on the existing tandem office parameters, adjusted to make them forward-looking, and consist of a mix of 5ESS (82.9 percent) and DMS-200 (17.1 percent) technologies (id.).

Among the switching UNE costs that Verizon proposes are $2.58 per month for an analog port; $0.002888 per originating end office minute; $0.002533 per terminating end office minute; $0.000272 per tandem minute; $0.001030 per minute for reciprocal compensation; and, for individual line features, monthly costs between $0.19 and $1.48 (RR-

DTE-48). Verizon contends that its switching cost studies incorporate the most current data available and the extensive experience of its engineers (Verizon Brief at 140).

b. Switch Material Prices

Verizon proposes specific vendor discounts that are inputs into Verizon's runs of the SCIS model, thus directly affecting the material investment costs that the SCIS model computes (Exh. VZ-36, at 131-166; Exh. VZ-37; Exh. VZ-42). Verizon contends that its proposed switch discounts best correspond with those that it will receive in the future as it incrementally upgrades and expands its network (Verizon Brief at 141). Verizon further asserts that all "new" switch discounts are unrealistic, and that the FCC, various commissions, and the Department have rejected other parties' switch cost methodology (id.).

According to Verizon, its sample of switch purchases for the year 2000 provides a realistic estimate of an efficient mix of switching purchases, and in support of this position, Verizon cites to the FCC's Local Competition Order, in which the FCC states that UNE rates should be based on "incremental costs that incumbents actually expect to incur in making network elements available to new entrants" (id. at 144-145, citing Local Competition Order at ¶ 685). Because Verizon has no plans to replace its existing switches, Verizon contends that the use of a "replacement" discount would be inconsistent with the TELRIC methodology applied by the Department in the Consolidated Arbitrations (id. at 145).

Verizon further opposes the assumption of new switch discounts because, according to Verizon, the FCC has "unequivocally rejected" such an assumption on various occasions, including in its reply brief to the Supreme Court (see Exh. VZ-55, at 9 n.7) and in its order approving Bell Atlantic-New York's Section 271 application, and also because, according to

Verizon, AT&T/WorldCom's new switch discount theory "makes no economic sense" (Verizon Brief at 146-147). Verizon asserts that carriers purchasing new switches expect to add "growth" lines in the future when additional capacity is needed, and thus the use of a new switch discount would only understate costs (id. at 147). Also, Verizon contends that if Verizon were to instantaneously replace its entire switching network, vendors would increase prices because of the increased demand and decreased supply (id.). Verizon contends that the "life cycle" discount, which is based on the ratio of new lines to growth lines over a five-year period, is also unrealistic (id. at 149).

Verizon argues that "no carrier operating in the real world would place an entire network of new switches instantaneously" but rather an efficient carrier would, over the long-run, have a mix of new and growth technologies (Verizon Reply Brief at 57). Verizon also explains that it "consented to the adoption" of the lower Rhode Island switching rates specifically to support its 271 application, and, that by so doing, was not conceding that they were required by TELRIC (id. at 59). Also, according to Verizon, the FCC did not, as AT&T suggests, espouse all new discounts in the Rhode Island 271 Order, but rather indicated that a switch discount should be between new and growth switch discounts (id., citing Rhode Island 271 Order at ¶ 34).

Finally, in defense of the Lucent prices in its cost study, which are approximately twice those of the Nortel prices, Verizon contends that the Lucent and Nortel products are not identical, and it disagrees with AT&T's suggestion that Verizon "lacks the business acumen to choose to purchase from Nortel if Lucent is offering the same deal at a price 95 percent higher than Nortel's" (id. at 60, 62-65). Verizon contends that the "only conceivable real-world result that can reasonably be expected in the future is the roughly equal mix of Nortel and Lucent switches used in the actual Verizon MA network today" (id. at 64). Verizon explains that the approximate split between the two vendors "is consistent with efficient procurement by a purchaser when dealing with two roughly equal competitive products" and implies that if Verizon purchased from only one supplier, the equipment prices could increase (id. at 64-65). Verizon also contends that if the TELRIC study assumed all new switches, then RTU costs would increase by approximately $59 per line as a result of the initial cost of the RTUs incurred when digital switches are deployed (id. at 65).

Verizon considers AT&T's reliance on a discount rate for a recent competitive bid for a Nortel switch misplaced because, according to Verizon, AT&T: (1) neglected to consider all relevant portions of the competitive bid; (2) failed to recognize that the EF&I percentage would exceed 40 percent because the installation cost would not change; and (3) erroneously inferred that the "isolated bid" would apply to a market where hundreds of new switches would be purchased (id. at 67-68).

c. "Getting Started" Costs and EPHC

The "getting started" cost is the investment that SCIS calculates on a per-switch basis for the common equipment necessary for a switch to become operational (Tr. 11, at 2085-2086, 2131-2132). The common equipment includes a central processor and memory, as well as other equipment. A getting started cost will differ with respect to the initial configuration (e.g., stand-alone versus switch with remotes).

Equivalent POTS half calls ("EPHC") is common equipment in the switch module of the Lucent 5ESS that consists of a processor complex and network equipment that connects lines and trunks to each other (Exh.VZ-42, at 15-16). The "half-call" refers to the two different functions associated with processing calls, where the originating half includes functions such as providing dial tone and collecting digits, and the second half includes functions for processing the call going to the terminating line or trunk such as providing power ringing to the terminating line (id. at 16). Instead of determining an investment per millisecond in SCIS, Verizon determines an investment per half-call to model the common equipment of switching modules (Tr. 12, at 2424)

Verizon states that non-traffic-sensitive costs include those costs that do not vary with increased levels of per-line usage and, furthermore, states that these costs are traditionally recovered through a flat-rate port charge. Verizon contends that traffic-sensitive costs are those that vary with usage and that Verizon traditionally recovers through usage charges (Verizon Brief at 152). Verizon states that both before and since the 1996 Act, it has consistently treated the cost of the switch port as non-traffic-sensitive and the other switch costs as traffic-sensitive, a treatment that, it contends, comports with "sound engineering practices" and cost-causation (id.). Verizon asserts that with the exception of the port, "every feature of the switch potentially requires replacement/additions as the level of usage on a line (the 'CCS' [one hundred call-seconds] level) increases," and thus, from a long-run perspective, are all variable with respect to usage levels (id. at 152-153).

The result of Verizon's proposal would be to allocate 49.41 percent of switch investment to non-traffic-sensitive UNEs and 50.59 percent of switch investment to traffic-sensitive UNEs, a ratio which, Verizon contends, the FCC's earlier findings support (id. at

153, citing Local Competition Order at ¶ 810, FCC Synthesis Model[120]). Verizon contends that the default allocation in the FCC's Synthesis Model of 30 percent to non-traffic-sensitive elements and 70 percent to traffic-sensitive elements, upon which AT&T/WorldCom relied in other proceedings, further supports Verizon's proposed cost allocation in this proceeding. According to Verizon, AT&T/WorldCom's proposal to consider less than 15 percent of end office investment as traffic-sensitive would "significantly drive up prices for residence and business customers with lower usage" (id. at 153).

Verizon counters AT&T/WorldCom's assertion that digital switches are limited only by port capacity by stating that "usage is by far the largest cost driver of additional switch capacity" (id.). According to Verizon, ultimately, non-port resources on the switch must be supplemented, and the amount of investment that will be necessary rises in proportion with anticipated usage (id. at 154). Verizon recommends that the cost of shared resources be assigned based on the amount of the cost of such resources that will be incurred through usage (id.). In further support of its assertion that the processor and other "getting started" investments are traffic-sensitive, Verizon states that usage determines the ultimate exhaust (id.). Also, because the EPHC system in Lucent 5ESS switches is limited by ports and call volume, Verizon assigns this investment to ports and to usage (id. at 155 n.136).

Verizon contends that AT&T/WorldCom's proposal to recover more costs on a non-traffic-sensitive basis would not only be inconsistent with cost-causation, but also would result in low-volume customers subsidizing high-usage customers. Furthermore, according to

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[120] The FCC adopted the Synthesis Model for the universal service proceeding, based on several different proposed models. See, generally, Universal Service Order.

Verizon, AT&T/WorldCom's proposal would "promote inefficient network usage, cause congestion in Verizon MA's switching network, and lead to underrecovery of switching investments" (id. at 155).

Verizon contends that usage determines ultimate exhaust of processors, and that, furthermore, switch resources are sized "based on their expected usage levels," causing the resource cost to increase as the expected level of use increases (Verizon Reply Brief at 70-71). Similarly, Verizon contends that EPHC-related investment tracks usage because the 5ESS switch has evolved specifically to avoid exhaust (id. at 71).

d. Trunk Utilization

Verizon applies utilization factors to digital line ports, analog line ports, and digital trunk ports (Exh. VZ-36, at 154; Verizon Brief at 158). Verizon's calculation of the trunk utilization factor is based, among other things, on an assumed administrative fill factor of 95 percent and an average fill factor of 90 percent (Exh. VZ-39, Part C-1, Section 38, Revised Workpaper at 4).[121] Verizon indicates that the average fill factor includes administrative spare (Exh. VZ-38, at 64). According to Verizon, because the SCIS model already accounts for five percent spare capacity, and because the assumption of an average 90 percent trunk utilization also includes administrative spare, Verizon increases the 90 percent assumed average fill (id.). Verizon also increased the average utilization to account for equipment breakage in SCIS (id.). In revisions to its original cost study, Verizon increased the proposed end office utilization

121 The administrative spare of five percent accounts for the capacity that Verizon maintains to accommodate customer movement, maintenance requirements, and plant equipment design (Exh. VZ-38, at 67). The average fill factor corresponds to Verizon's estimate of its actual utilization (id.).

trunk factor from 94.28 percent to 116.90 percent[122] (Exh. VZ-37, Part C-1, Section 38, at 4; Exh. VZ-39, Part C-1, Section 38, Revised Workpaper at 4). Verizon indicates that as of November 1, 2001, other carriers use approximately 62 percent of its trunks and that its actual trunk utilization is approximately 76.6 percent (Exh. VZ-38, at 62, 64).

Verizon characterizes its utilization factors as forward-looking (Verizon Brief at 158). Countering AT&T/WorldCom's claim that the utilization is double-counted, Verizon states that AT&T/WorldCom misunderstand the SCIS model (Verizon Brief at 158). According to Verizon, the SCIS administrative fill input enables Verizon to maintain necessary spare for customer movement, maintenance requirements, and breakage (the fact that many network components come in capacity increments which rarely coincide with actual demand) (id. at 158). Verizon argues that the SCIS model does not fully incorporate its utilization assumptions and that therefore, Verizon "must further account for utilization in its cost studies in order to reach the forward-looking utilization rate determined by Verizon MA's engineers" (id.). Verizon explains further that the "result is not a double-counting but one thorough counting" (id.). Verizon also explains that its proposed trunk utilization factor does not "double-dip" but rather Verizon offsets the average fill factor by the administrative fill factor (Verizon Reply Brief at 75).

Verizon assumes trunk traffic of 15.88 CCS per trunk for the 5ESS switch and 14.55 CCS per trunk for the DMS-100 switch, based on the Wilkerson Table (Verizon Brief at 159). In response to AT&T/WorldCom's assertion that Verizon's model does not assume sufficient

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122 The 116.90 percent factor does not measure trunk utilization but rather is a component of Verizon's derivation of its utilization.

trunk traffic, Verizon contends that their CCS per trunk proposal is unsupported (id.). In addition, Verizon states that it has no control over the volume of traffic that interexchange carriers ("IXCs") and CLECs choose to send over Verizon trunks, and thus Verizon states that it cannot affect the efficiency with which its trunks are used (Verizon Brief at 159-160; Verizon Reply Brief at 76). Verizon asserts that AT&T/WorldCom's witness Ms. Pitts was unable to explain either her selection of a traffic engineering table or her assumed volume of traffic per trunk (Verizon Brief at 159 n.142). Verizon also claims that WorldCom applies inconsistent evidentiary standards; in one instance WorldCom recommends that the Department ignore the experience of a product manager with 25 years experience with port additives, and in another instance recommends that the Department rely on Ms. Pitts' years of experience (Verizon Reply Brief at 75).

e. Feature Port Additive Costs

Verizon defines the costs of feature port additives as "the incremental hardware investments associated with optional features such as three-way calling" (Verizon Brief at 160). Verizon uses SCIS/IN, a module of SCIS, to compute feature-specific incremental investments (id.). Verizon asserts that it has fully documented the feature port additive costs, and that the usage inputs for SCIS are "based upon judgments from product management . . . [with] 25 years experience" (id.). Moreover, Verizon states that AT&T/WorldCom has not offered evidence of its own of usage amounts or lower costs (id.). Verizon acknowledges that it does not keep usage data, but in the absence of such data contends that "the product manager for a given feature is the individual able to provide the best estimate of the extent of that usage in the absence of a separately independent study" (Verizon Reply Brief at 77-78). Verizon observes that neither WorldCom nor AT&T have provided an independent study of their own (id. at 78).

f. EF&I Factor

Verizon's proposed EF&I factor of 1.4027, i.e., 40.27 percent, for switching equipment translates a materials-only investment into an installed investment (Exh. VZ-37, Part G-3, at 1, Workpaper 8). Verizon computes its proposed factor based on information from its 1998 Detailed Continuing Property Record ("DCPR") database by dividing the sum of the total installed investment for hardwired and plug-in equipment by the sum of the materials-only investment of the same two categories of equipment (Exh.VZ-37, Part G-3). Verizon relies on investment from 1998 because it is the most recent year for which data were available when Verizon prepared its cost study (id.). Verizon also develops the factor on a Verizon-East wide basis because it installs many investments in one state that serve multiple jurisdictions (id.). In its original TELRIC filing in this case, Verizon provided four aggregate numbers in support of its EF&I calculation: it provided total installed investment and total material investment separately for hardware equipment and for plug-in units (id., Part G-3, Workpaper 8).

Verizon states that its EF&I factor is based on "reliable data and sound engineering judgment" (Verizon Brief at 51). Although Verizon concedes that one cannot determine the specific costs of each component of the EF&I factor for each installed job, it contends that "the actual total installed cost is all that is required to evaluate the reasonableness of Verizon MA's EF&I assumptions" (id. at 52). As further evidence of the reliability of the EF&I factor, Verizon observes that the regional DCPR database includes billions of dollars of installed investment (id. at 52-53). According to Verizon, using information other than its "actual experience" to determine the EF&I would have been unreasonable (id. at 53). Furthermore, Verizon contends that "there is no basis to assume that the EF&I relationships from 1998 will differ from those in the forward-looking network" (id.). According to Verizon, there have not been any significant technological changes in the engineering and installation of equipment since 1998, nor are any expected (id.).

Verizon faults AT&T/WorldCom's methodology for determining a proposed factor of 25 percent, explaining that data from 1992, upon which AT&T/WorldCom rely to derive one of the EF&I cost components, are less relevant than those from 1998 (id. at 161-162). Also, Verizon counters AT&T/WorldCom's argument that Verizon's performance of its own engineering and installation is less efficient than if it put the same work out for competitive bidding by asserting that: (1) Verizon has an incentive to be efficient; and (2) Verizon does competitively bid work in many of its jurisdictions (id. at 162). Verizon also asserts that the EF&I ratio associated with AT&T's own 5ESS switch is at least 1.405 (id. at 163).

Verizon responds to the concern that the DCPR database does not produce installation costs for individual pieces of equipment by stating that it never purported that the DCPR could do so (Verizon Reply Brief at 78-79). Verizon opposes an EF&I factor based on 1992 investment because switching costs then differ from today's switching costs, and because the engineering, furnishing, and installation techniques then differ from those used today (id. at 79).

g. Call Completion Ratio

The call completion ratio (the percentage of calls that are completed) is a key component of Verizon's non-conversation time ("NCT") factor. In its cost study, Verizon includes a NCT factor of 1.113 to account for the time a switch is used not for conversation time but rather to complete a call including the time for dialing, ringing, and call set-up (Exh. VZ-37, Part C-2, Section 1, Workpaper at 1, line 29; Exh. VZ-36, at 160). Because Verizon multiplies the NCT factor by an intermediate MOU cost result to determine the proposed MOU cost, the NCT factor directly affects the MOU cost results. Verizon determines the NCT factor by first dividing the estimated NCT per call by a proposed call completion ratio of 0.715, which yields the estimated NCT per call in minutes. Next, Verizon sums this estimated NCT and the average holding time per call, and then divides this sum by the average holding time per call to yield a final adjustment of 1.113 (Exh. VZ-37, Part C-3, Section 6, Workpaper). Verizon's proposed call completion ratio is based on a study conducted in 1992 (Exh. ATT-VZ 4-49-S).

Verizon defends its reliance on 1992 data as being the most recent available and also because it contends that call completion data does not tend to vary from state to state or from time to time (Verizon Reply Brief at 85). Verizon contends that AT&T/WorldCom fail to support their proposed call completion ratio of 85 percent, and further asserts that this proposed completion ratio is "purely speculative" (Verizon Brief at 166-167). Verizon faults WorldCom and AT&T for failing to submit any data of their own concerning NCT factors or call completion factors (Verizon Reply Brief at 85). Verizon counters AT&T/WorldCom's belief that an increase in answering machines since 1992 supports a higher call completion ratio by stating that call blocking and caller identification have also increased, which, according to Verizon, would increase NCT (Verizon Brief at 167). In conclusion, Verizon recommends that the 1992 data it provided should "be deemed more reliable" than the "vagaries of Ms. Pitts' musings" and as the "best evidence available" (Verizon Brief at 167; Verizon Reply Brief at 86). Responding to AT&T's concern that Verizon's tariff also includes an adjustment for NCT, Verizon indicates that it "will ensure against double-counting at the time of its compliance filing" (Verizon Reply Brief at 86, n.87).

h. Busy Hour to Annual Conversion Factor

Verizon determines its proposed MOU cost by first estimating the minutes for which its switches are used in the busiest hour of the business day during a "busy month" of a "busy season" (Verizon Brief at 164). Verizon assumes approximately 26 million busy hour MOU (Exh. VZ-37, Part C-2, Section 1, Workpaper at 1, Part C-2, Section 4, Workpaper at 2). Verizon computes an average number of 251 business days by subtracting 104 weekend days and ten holidays from 365 calendar days. Verizon then assumes a busy-hour-to-all-hours-of-day ("BH/AHD") ratio of 0.083, which is the portion of the busy day's traffic that the busy hour is assumed to represent. If, for example, traffic were evenly distributed throughout a 24-hour period, this ratio would be one hour divided by 24 hours, i.e., 0.042 (Tr. 12, at 2340-2341). Verizon's proposed "busy hour to annual conversion factor" of 0.00031, which Verizon uses to compute the MOU cost, is derived by dividing its proposed BH/AHD ratio of 0.083 by 251 (Exh. VZ-37, Part C-3, Section 7).

Verizon opposes Z-Tel's recommended use of 308 business days because, according to Verizon, the recommendation inappropriately assumes that weekend use is equal to half of non-weekend use (Verizon Brief at 165). Verizon also contends that because traffic on all days is not identical, it would be inappropriate to use 365 days. Furthermore, Verizon observes that neither in her rebuttal nor her surrebuttal testimony does Ms. Pitts object to the use of 251 days (Verizon Brief at 166; Verizon Reply Brief at 82-83).

Verizon points out that the FCC's Modified Synthesis Model uses 270 days and a BH/AHD ratio of 0.10, and states that these assumptions together yield a conversion factor of 0.00037, which is higher than Verizon's proposed factor of 0.00031. Verizon contends that the use of the FCC's findings would yield higher MOU costs than Verizon's proposed factor does (Verizon Brief at 166). Verizon recommends that the Department disregard Ms. Pitts' "speculation" about the BH/AHD ratio (Verizon Reply Brief at 84).

i. Intra-Switch Calls

Verizon defends its proposed application of both originating and terminating local switching charges to intra-switch calls by stating that two separate switching functions are performed (Verizon Reply Brief at 89). Verizon explains that it has appropriately separated switching-related charges into originating and terminating components because there are calls that are passed from Verizon to an IXC or from an IXC to Verizon, in which case Verizon applies only an originating or terminating switching charge. By contrast, Verizon asserts that when it does not hand off calls to other carriers, then Verizon both originates and terminates calls (id. at 90).

2. AT&T

a. Overview

AT&T, jointly with WorldCom, sponsors the testimony of Catherine Pitts, which corrects alleged flaws in Verizon's switching cost study, and AT&T also separately sponsors the testimony of Robert Mercer, which supports the use of an alternative model, the HAI 5.2a-MA, for computing switching UNE cost (Exh. ATT-20, Exh. ATT-21, Exh. ATT-25, Exh. ATT-26). AT&T: (1) contends that Verizon substantially overstates switching costs; (2) restates switching costs based on proposed modifications to Verizon's cost study; and (3) asserts that information provided in response to a record request justifies yet additional corrections to Verizon's cost study (AT&T Brief at 52).

Citing the FCC's Rhode Island 271 Order, AT&T asserts that the FCC has clarified that, under TELRIC, state commissions should rely on either all new switch prices or mostly new switch prices (id.). AT&T also asserts that Verizon's decision in February 2002 to lower switching usage rates in Rhode Island by more than half, to levels approximating those in New York, demonstrates that Verizon's proposed rates for Massachusetts are exorbitant (id. at 53-54). However, according to AT&T, even New York's switching rates are too high because they are based on cost data from 1997-1998, and telecommunications is a declining cost industry (id. at 54).

b. Switch Material Prices

AT&T faults Verizon for failing to analyze whether its assumption that it would purchase the same number of Lucent and Nortel end office switches as are currently in Verizon's embedded network represents the least cost most efficient forward-looking arrangement (id. at 59). Because Lucent 5ESS and Nortel DMS-100 switches are functional substitutes, AT&T asserts that Verizon should have assumed the use of all Nortel switches, which, according to Verizon, require an average switch investment of $82.62 per POTS line, approximately half the $157.87 investment per line required by Lucent 5ESS switches (id. at 59-60).

Ms. Pitts restates Verizon's cost study, replacing the Lucent discount input to the SCIS model with the Nortel growth discount because the Nortel discount for new switches is the same as that for growth equipment. Her analysis yields Lucent switch material investment of $82.83 per POTS line, a result that AT&T contends is validated by the Nortel switch material price per line yielded by Verizon's study (id. at 61).

AT&T, however, further asserts that information newly obtained from Verizon in response to a Department record request, RR-DTE-49, shows that Verizon pays substantially less for new Nortel switches than the contract price of $82.62 that Verizon's cost study assumes (id. at 62). According to AT&T, using the pricing information provided in Verizon's SCIS model in response to the record request, and making no other change, lowers the Nortel switch material investment per POTS line from the as-filed result of $82.63 to $17.35 (id. at 63-64). AT&T contends that the more recent cost data, which correspond to the results of a competitive bidding process, should be used in Verizon's switching cost study (id. at 64-65). AT&T summarizes two versions of proposed costs for selected rate elements; one incorporates information provided in response to RR-DTE-49 on Verizon's Nortel competitive bidding, and the other which does not (id. at 65).

AT&T asserts that the Department should set UNE switching rates based on 100 percent new switch prices, and if the Department were, contrary to this recommendation, to assume some growth, such growth should represent no more than ten percent of the total switch pricing (id.). AT&T also contends that the local switching costs that the HAI 5.2a-MA model estimates are too high because they are based on switch material costs that the FCC adopted based on cost data from 1983 to 1995, brought current to 1999 levels (id.). According to AT&T, Verizon's switch cost data are more current and demonstrate that the HAI Model inputs are overstated (id. at 66).

Referring specifically to information that Verizon ultimately provided in response to RR-DTE-49-S, and that Verizon had provided earlier to the FCC, AT&T criticizes Verizon for attempting to "hide" information about its actual switching prices (id. at 66-68). AT&T faults Verizon for failing to provide information relevant to switch material prices in a timely manner, and, in support of this criticism, observes that: (1) AT&T sought through discovery switch pricing information from Verizon as early as May 2001; (2) Verizon's witness, Ms. Matt, was also a witness in the Virginia arbitration proceeding before the FCC; and (3) the ground rules for this proceeding obligated Verizon to supplement its discovery responses on a continuing basis (id.).

AT&T contends that TELRIC principles require the Department to estimate switching costs "based on the most efficient, least cost way of serving the demand for the entire element of switching" and furthermore UNE switching costs should be based on the prices available to Verizon for new switches (id. at 68). In support of its position, AT&T quotes from the FCC's Rhode Island 271 Order, including, among other things, the FCC's statement that "rates based on an assumption of all growth additions and no new switches do not comply with TELRIC principles" (id. at 71, citing Rhode Island 271 Order at ¶ 34).

Although AT&T's primary recommendation is that the Department adopt a 100 percent new switch discount, should the Department decide otherwise, AT&T recommends that Verizon's switching costs be based on an assumption of no less than 90 percent new switch pricing and no more than ten percent growth switching. According to AT&T, Verizon's witness described the appropriate way to meld new and growth switching as entailing a model whereby one assumes all new switches that provide for some growth and then, one further assumes that the ILEC adds additional capacity at the end of the three-year planning period to handle more growth (id. at 74). According to AT&T, its witness, Ms. Pitts, conducts such an analysis in response to RR-DTE-56 (id. at 75). This analysis assumes that all switches are replaced in year one and then estimates the growth equipment necessary for the switch, assuming annual line growth of three percent (RR-DTE-56), which then yields 80 percent new equipment and 20 percent growth equipment (AT&T Brief at 75). However, AT&T argues that the annual line growth should be assumed to be 1.5 percent, rather than three percent, which would yield a blend of 90 percent new and ten percent growth equipment (id.).

AT&T opposes Verizon's proposed 50/50 life-cycle split between new and growth equipment because AT&T considers Verizon's reliance on its purchase of switches during the five-year period of 1996-2000 as irrelevant to an estimate of long-run forward-looking economic costs (AT&T Brief at 76; AT&T Reply Brief at 65-66). According to AT&T, TELRIC requires a forward-looking network built from scratch rather than the state of Verizon's switching equipment "that happened to be in place at the beginning of this five year period" (AT&T Reply Brief at 66). Also, AT&T faults Verizon's life-cycle analysis because Verizon failed to present any information regarding its past purchases of Nortel switches (id. at 64).

Finally, AT&T computes an alternative version of revised Verizon costs to incorporate: (1) Ms. Pitts' proposed revisions to Verizon's switching cost study; (2) the use of a 90/10 melding of new and growth equipment; and (3) substitution of a lower Nortel discount based on RR-DTE-49 (AT&T Brief at 77).

c. "Getting Started" Costs and EPHC

AT&T states that Verizon mischaracterizes "getting started" and EPHC costs as traffic-sensitive (AT&T Brief at 86-88; AT&T Reply Brief at 69-70). AT&T explains that getting started costs are "fixed" because they do not increase if the switch serves additional minutes or lines, and furthermore because ports "will exhaust before usage causes the processor to exhaust" (AT&T Brief at 86; AT&T Reply Brief at 69). As evidence of its assertion that the limiting factor in a switch is ports rather than processing capacity, AT&T states that digital switches "are basically large computers" that provide memory and processing power that substantially exceed expected demand (AT&T Brief at 86). AT&T also relies on the actual average processor utilization over the life of a Lucent 5ESS switch and a Nortel DMS switch, as shown in Verizon's cost study, to further substantiate its position (id., citing Exh. ATT-20-P, exh. CP-4).

AT&T contends that Verizon inaccurately calculated the percentage of end office investment that AT&T proposes to be traffic-sensitive (AT&T Reply Brief at 70-71).

Regarding the latter point, AT&T states that its proposal allocates 25.4 percent, not 15 percent, of end office equipment to the MOU (id.).

AT&T observes that Verizon acknowledges that, even if the planning period were five years rather than the proposed three years, getting started costs would not increase although traffic in MOUs and investments would increase (AT&T Brief at 87, citing Tr. 12, at 2351-2352). AT&T recommends the Department assign such costs, which, it contends, do not vary with usage, to the fixed monthly rates for ports and eliminate them from MOU calculations (id. at 87-88). For similar reasons, AT&T also recommends that certain other switching costs should be assigned to the port function including such costs as EPHC costs (AT&T Brief at 88; AT&T Reply Brief at 71).

d. Trunk Utilization

According to AT&T, Verizon makes three assumptions that in aggregate result in an underutilization of common trunks (AT&T Brief at 82). Specifically, AT&T indicates that Verizon: (1) sets the expected utilization of trunks at 1500 CCSs per busy hour ("BH"); (2) applies a 95 percent administrative fill factor within the SCIS model; and (3) applies another utilization factor of 94.28 in the cost study workpapers (id.). AT&T computes the net result to be only 37 percent trunk port utilization, which, according to AT&T, is "unreasonably low" and causes inflated common trunk rates (id. at 82-83).[123]

AT&T proposes two specific modifications to Verizon's proposed trunk port utilization assumptions (id. at 83). AT&T recommends that the trunk utilization be set at a minimum of 20 CCS/BH and as high as 27 CCS/BH (id.). The higher number would result in minimal call

[123] The 37 percent figure is calculated as follows: (1500)(0.95)(0.9428) ÷ 3600.

blocking of only 0.1 percent for a 50-member trunk group, according to AT&T (id.). AT&T also recommends that, to avoid duplication, the proposed utilization factor of 94.28 percent be set to 100 percent (id.). AT&T observes that these adjustments would result in an effective utilization of 52.8 percent, which is less than Verizon's reported trunk utilization of 76.6 percent as of November 1, 2001 (id.). Furthermore, AT&T observes that if its proposed level of 27 CCS were also used, the effective utilization would be 71.25 percent (id.).

According to AT&T, Verizon has not substantiated the use of a second utilization factor in the cost study workpapers. AT&T contends that the SCIS inputs for trunk utilization size the trunk port investment to allow for sufficient spare capacity and that, therefore, it is unnecessary and inappropriate to apply a trunk utilization factor within Verizon's cost study (id. at 84). Furthermore, AT&T argues that Verizon fails to justify the need for a second factor of 94.28 percent or the merit of 15 CCS/BH trunk utilization (AT&T Reply Brief at 66). The utilization of common trunk port capacity is "substantially understated," according to AT&T, and serves to inflate common end office and tandem trunk port MOU rate element costs (AT&T Reply Brief at 66-67; AT&T Brief at 82-85). AT&T contends that Verizon does not explain the purpose of the second factor, except to say it is meant "to reach the forward-looking utilization rate determined by Verizon MA's engineers" (AT&T Reply Brief at 67). AT&T disputes Verizon's interpretation of Ms. Pitts' discussion of CCS/BH trunk utilization, explaining that Verizon did not acknowledge: (1) the correction from 22.3 CCS per trunk to 27.3 CCS per trunk in her testimony; (2) that consulting the Erlang Table is "standard industry practice"; and (3) the expertise of Ms. Pitts in her statement that most trunks operate above 20 CCS per trunk (id. at 67-68).

e. Feature Port Additive Costs

AT&T considers the inputs that Verizon uses to compute the costs of proposed feature port additive charges to be inadequately supported (AT&T Brief at 91-92; AT&T Reply Brief at 72). Furthermore, AT&T contends that the basic cost of switches should include these costs, because feature port additives themselves are associated with local telephone services (AT&T Brief at 91). In further support of its position, AT&T cites to FCC precedent, in which "switch-based features" are included with switch prices (id., citing Platform Order at ¶ 75). Finally, AT&T argues that Verizon's support of its inputs, specifically a description of a decision-making process whereby inputs were set based on managers' opinions, is insufficient (id. at 91-92). AT&T contends that a more substantive analysis would have entailed information about usage and about penetration (id. at 92). For these reasons, AT&T recommends the Department disallow feature port additive costs entirely or, in the alternative, that the Department set rates to be the same as or less than the rates restated by Ms. Pitts in her revised rebuttal testimony (id.).

f. EF&I Factor

AT&T recommends an EF&I factor of 25 percent (i.e., material investment would be multiplied by 1.25 to yield total investment) for the costs of vendor engineering, Verizon's engineering and switch installation, and sales tax, an amount that AT&T contends is consistent with those of comparable ILECs (AT&T Brief at 79). AT&T asserts that the fully installed cost of a switch has predictable components, and, thus, the cost should be similar throughout the industry (id.). According to AT&T, Verizon's cost is excessive because Verizon refuses to competitively bid jobs and has "inefficient switch installation practices under expensive labor contracts" (id.).

AT&T constructs its recommended factor of 25 percent based on twelve percent for the vendor-related work, eight percent for the EF&I work that an ILEC typically does, and a five percent sales tax (id. at 80). AT&T indicates that SCIS reflects Telcordia's estimate that vendor costs typically comprise twelve percent of the switch material cost (id.). The eight percent ILEC component of AT&T's proposed factor corresponds with the FCC's estimate in 1999 in its USF proceeding which, according to AT&T, is further corroborated by the figure of ten percent that NYNEX and Bell Atlantic reported in the FCC's 1992 Open Network Architecture ("ONA") proceedings (id. at 80 n.387, citing FCC's Inputs Order, ¶ 307; AT&T Brief at 80, n.388, citing Exh. VZ-ATT/WCOM 1-6, RR-DTE-58). AT&T defends the use of 1992 data on the grounds that, if anything, the data overstate the engineering/installation costs due to advances in productivity and techniques (AT&T Reply Brief at 66).

AT&T contends that Verizon has not met its burden of proof and has failed to substantiate any of the engineering and installation costs that make up the EF&I factor (AT&T Brief at 81; AT&T Reply Brief at 65). Specifically, AT&T contends that because Verizon's data cannot be disaggregated, it is "impossible to verify that Verizon's estimation of total installed costs in its DCPR records is reasonable" (AT&T Brief at 80). Also, AT&T questions whether investment purchased in 1998 is representative of forward-looking installation costs, and observes that a Verizon witness testified that "depending on the type of equipment installed that year, you'll get different relationships" (id. at 81-82, citing Tr. 13, at 2517-2523). Furthermore, according to AT&T, installation costs in 1998 were associated primarily with growth parts, yet the ratio of installation costs to material prices for new switches could be significantly less (AT&T Reply Brief at 66).

g. Call Completion Ratio

AT&T criticizes Verizon's proposed call completion ratio because it is based on data from 1992, and thus, according to AT&T, "cannot possibly capture the huge increase in call completions due to answering machines and voice messaging services" (AT&T Brief at 93). AT&T disputes Verizon's contention that caller identification would have somehow reduced the call completion ratio because, according to AT&T, answering machines and voice mail still complete calls even when individuals decide not to pick up the telephone (id.). AT&T argues that "[s]imply because Verizon does not have the ability to provide up-to-date information on the NCT factor does not mean that ten years worth of technology and its effect on this factor should be ignored" (AT&T Reply Brief at 73). AT&T recommends that the call completion ratio used in Verizon's switching cost study be increased from the proposed level of 71.5 percent to at least 85 percent to account for the increased call completions resulting from subscribers' use of answering machines, voicemail, and caller identification (AT&T Brief at 94). According to AT&T, assuming 85 percent rather than 71.5 percent for the call completion ratio reduces the MOU cost by two percent (id.).

Furthermore, AT&T observes that D.T.E. Tariff No. 17, Part B, Section 6.3 increases recorded originating measured minutes by NCT and call attempt additives, and recommends that Verizon be ordered to remove these additives so that Verizon does not recover non-conversation costs twice, once through the UNE cost study, and then again in the tariff (id.).

h. Busy Hour to Annual Conversion Factor

AT&T recommends that Verizon use 365 days rather than 251 days to spread switching costs over all MOUs, and that, alternatively, the Department adopt 308 days, as did the NYPSC, in order to allocate switching equipment costs more accurately (AT&T Brief at 95-96; AT&T Reply Brief at 74). According to AT&T, Verizon's proposed use of 251 business days would provide 114 days of "pure profit" for Verizon. AT&T explains that Verizon's use of only business days allows Verizon to recover all of its switching investment from traffic that occurs on these 251 days, but that, because subscribers also make telephone calls on weekends and holidays, Verizon will over-recover its switching costs (AT&T Brief at 95-96).

AT&T also recommends that Verizon use a BH/AHD ratio of approximately seven percent because, according to AT&T, the trend for the BH/AHD ratio has been to decline. AT&T points out that in the 1996 Consolidated Arbitrations, Verizon used ten percent based on 1995 data, and that in this proceeding, Verizon uses 8.3 percent based on 1997 data, and that therefore, seven percent represents a similar trend for today's traffic (id. at 97-98). AT&T asserts that the historical traffic patterns, whereby business calling peak mid-morning and residential calling peak in the early evening, have been replaced by patterns where, due to Internet usage and "always on" work patterns, switches have multiple busy hours. This change in traffic patterns, according to AT&T, has flattened out the historic peaks (id. at 96-97). According to AT&T, if, for example, the ratio of busy hour calls to total day calls dropped 20 percent from 1997 to today – that is, to 6.6 percent – the MOU cost would decline similarly by 20 percent (id. at 97). AT&T points out that: (1) Verizon has not conducted a recent study to determine whether its proposed 8.3 percent assumption accurately represents today's traffic; and (2) Verizon's reliance on 8.3 percent undermines its criticism of AT&T for not supporting the "industry standard" of ten percent (AT&T Brief at 97; AT&T Reply Brief at 75).

i. Intra-Switch Calls

AT&T recommends that the Department reject Verizon's proposal to apply two switching charges for an intra-switch call, and observes that the Department rejected this proposal in the D.T.E. 98-57 proceeding (AT&T Reply Brief at 75-76, citing Tariff No. 17 Order at 219, citing D.T.E. Tariff No. 17, Part B, Section 6.3.2.B). AT&T indicates that in an intra-switch call "the originating and terminating functions are performed as a single operation in one switch; there is not a second switch processing function at another location" (AT&T Reply Brief at 76). In addition, AT&T notes that neither New York nor New Hampshire has approved the intra-switch calls proposal (id.).

3. WorldCom

a. Overview

WorldCom asserts that Verizon has proposed unbundled switching rates that significantly exceed TELRIC, and supports the port and switching rates that Ms. Pitts recommends (WorldCom Brief at 19). WorldCom also contends that "Verizon's approach - 'not having to start from scratch'" conflicts with the FCC interpretation which "requires 'the assumption of a forward-looking network built from scratch'" (WorldCom Reply Brief at 1, citing Verizon Brief at 19, Rhode Island 271 Order at ¶ 34) (emphasis in original).

b. Switch Material Prices

WorldCom opposes the use of a growth discount based on a year's worth of switch equipment purchases and contends that instead Verizon should use the substantial discounts Verizon receives when purchasing new switching equipment (WorldCom Brief at 21; WorldCom Reply Brief at 52). In support of this position, WorldCom quotes the FCC's Rhode Island 271 Order, in which the FCC questioned an assumption of only growth additions (WorldCom Brief at 22). WorldCom recommends that the investment be discounted by the percentage in Attachment CP 3 to Exh. ATT-20, which is derived from the so-called "Megabid" contract that Verizon first negotiated with Lucent when it upgraded its network from analog to digital switches (id. at 23). WorldCom also relies on the information provided in response to RR-DTE-49-S-P in support of its contention that Verizon's proposed discount is inappropriate (id.). WorldCom asserts that the large difference between the Lucent price per line of $166 and the Nortel price per line of approximately $86 further demonstrates the inappropriateness of Verizon's proposed discount for Lucent switches (id. at 24).

WorldCom opposes the use of a "life cycle discount" because such an analysis "deviates further and further from the TELRIC requirement of a network built from scratch the further out the life cycle analysis is extended" (WorldCom Reply Brief at 53). WorldCom faults Verizon's life cycle analysis because, among other things, one cannot determine when a growth job occurred relative to the switch's installation (id. at 54). WorldCom explains that if Verizon's analysis in RR-DTE-66 included a growth job for a switch that had been installed seven years earlier, it should be excluded from the five-year ratio that Verizon computed (id.).

c. “Getting Started” Costs and EPHC

WorldCom, pointing to causation as the criterion for cost-allocation, states that Verizon has misallocated the getting started costs, the RTU ACF, and the EPHC costs to the traffic-sensitive elements (WorldCom Brief at 28). WorldCom explains that digital switches are port-limited and not MOU capacity-constrained, and relies on processor utilization figures to support its position (id. at 29). In response to the proposition that “users that use a bigger share of resources ought to pay more for use of the resources,” WorldCom recommends that the Department instead apply the principle of cost causation (id. at 30). WorldCom argues that Verizon “confuses resource utilization with cost causation” and explains that although a higher-volume customer uses more of the processor capacity of a switch, such use does not lead to additional investment because a user could not consume so much capacity as to cause Verizon to purchase another switch (WorldCom Reply Brief at 56).

WorldCom argues that Verizon’s omission of getting started and RTU costs from its calculation of reciprocal compensation rates is a tacit admission that these costs are not traffic-sensitive (WorldCom Brief at 30-31). WorldCom explains that the FCC states that “only that portion of the forward looking economic costs of end office switching that is recovered on a usage-sensitive basis constitutes an ‘additional cost’ to be recovered through termination charges” and the FCC further states that “non-traffic sensitive costs should not be considered ‘additional costs’ when a LEC terminates a call that originated on the network of another carrier” (id. at 31, citing Local Competition Order at ¶ 1057). WorldCom recommends that getting started costs and RTU fees be recovered by the monthly port rate (id. at 32).

WorldCom explains that, while EPHC costs are not "fixed," they ought to be assigned to the port because EPHC costs are limited by lines and trunks (id. at 32-33). WorldCom contends that the "record evidence before the Department would support a rate design under which all costs are assigned to the monthly port charge, on the basis that switch costs are driven by the number of ports" (id. at 33). Instead, WorldCom recommends that 75 percent of the switching costs be assigned to ports and 25 percent to usage, which, according to WorldCom, would be a conservative allocation (id.).

d. Trunk Utilization

According to WorldCom, Verizon's understatement of trunk port capacity inflates usage charges (id. at 35). Relying on Ms. Pitts' testimony, WorldCom recommends that 20 CCS/BH be assumed rather than the 15 CCS/BH per end office trunk and 18 CCS/BH per tandem trunk that Verizon proposes (id. at 35-36).

e. Feature Port Additive Costs

WorldCom contends that the use of more appropriate assumptions for the switching investment discount and the EF&I factor will, in part, correct Verizon's feature port additive costs (WorldCom Brief at 36). However, WorldCom argues that as a separate and more important matter, Verizon failed to substantiate the inputs used to compute feature port additive costs (WorldCom Brief at 36). WorldCom considers Verizon's supplemental reply to Exh. ATT-VZ 4-1 inadequate to support the input values Verizon used in the SCIS/IN model (id. at 37). WorldCom argues that "a product manager does not have the data, and is not qualified to opine upon, the usage patterns of port additives; that is an engineering question, not a product management question" (id.). Because, according to WorldCom, Verizon failed to meet its burden of proof, WorldCom recommends that the Department set Verizon's feature port additive costs at zero (id.).

f. EF&I Factor

WorldCom considers Verizon's EF&I factor of 40 percent unreasonable, contending that there is "a critical failure of proof" (id. at 25). WorldCom proposes an alternative EF&I factor of 25 percent (id.). According to WorldCom, Verizon's proposed EF&I factor is incorrect because "it fails to calculate the installation costs of new switches" (id.). In support of its argument, WorldCom questions whether information derived from records is a good substitute for an invoice-by-invoice analysis, and whether the data in the 1998 DCPR are valid as indicators of the work involved in equipping a new switch network (id. at 25-27).

Furthermore, WorldCom observes that Verizon has not made information available to substantiate the in-place costs (i.e., types of activities, labor rates, engineering labor hours, installation labor hours, and miscellaneous equipment), yet according to WorldCom, such information is necessary to explain the difference between material cost and claimed installed cost (id. at 26). WorldCom states that Verizon appears to be relying on historic and/or embedded cost data for its EF&I factor, which contradicts the TELRIC methodology and, especially in the case of a declining cost industry, would not capture achievable efficiencies (id.).

WorldCom's proposed 25 percent factor consists of three components, an ILEC component, a vendor component, and sales tax. For ILEC costs, WorldCom relies on 1992 data (RR-DTE-58) and data from the USF proceeding (WorldCom Brief at 27). For the vendor component, WorldCom indicates that it relies on Ms. Pitts' analysis of vendor costs based on her runs of the SCIS model (id., citing Tr. 11, at 2033). These two portions combined with a sales tax yields the approximate 25 percent EF&I factor that WorldCom recommends (id. at 28). Finally, countering Verizon's argument that the EF&I factor should increase if the dollar amount for switch investment decreases (because a decline in investment may not necessarily alter installation costs), WorldCom states that Verizon has overstated both investment and installation costs, and thus it would be appropriate to decrease both (id.).

According to WorldCom, the use of a single year's worth of equipment installations results could penalize CLECs because 1998 may have been a year in which Verizon has an above-average number of labor-intensive equipment installations (WorldCom Reply Brief at 32). Furthermore, WorldCom contends that Verizon has not shown that "the equipment mix to be installed in an existing network in any one year accurately reflects the equipment mix needed to get a new network up and running" (id.). Also, WorldCom argues that the 1998 relationship between material costs and installed costs is inflated because the "largely factory-assembled, pre-wired, pre-tested, modular equipment that would be installed at the creation of a new network would clearly have lower relative installation costs than equipment engineered to fit with an existing infrastructure, which is often assembled on-site" (id.). WorldCom considers it ironic that in the context of the call completion ratio, Verizon proposes that the Department rely on 1992 data but that in the context of the EF&I factor, Verizon asserts that 1992 data are too old (id. at 60). WorldCom contends that the 1992 EF&I data are more reliable than the 1998 DCPR data because they include information about the relationship between ILECs' investment and installation costs (id. at 60-61). Also WorldCom observes that no one prevented Verizon from developing costs based on its actual installation costs (id. at 61).

g. Call Completion Ratio

WorldCom offers several arguments in support of a recommended call completion ratio of 85 percent rather than the 71.5 percent proposed by Verizon. WorldCom observes that Verizon's factor is based on old data, and further observes that although Verizon recognizes that answering machines would cause the completion ratio to increase, Verizon offers, without proof, a claim that other factors such as caller identification and call blocking would offset this effect (WorldCom Brief at 38). WorldCom observes that the significant penetration of call waiting among residential customers also contributes to an increase in the call completion ratio and contends that caller identification, contrary to Verizon's argument, would likely cause unwanted calls to be completed by answering machines rather than to go unanswered (id. at 38-39).

h. Busy Hour to Annual Conversion Factor

WorldCom proposes that the BH/AHD ratio reflect the usage of the switch over 365 days rather than the 251 days proposed by Verizon, and further recommends that, at a minimum, the Department adopt the 308 days that the NYPSC recently adopted (WorldCom Brief at 35). WorldCom explains that if the cost is computed based only on business day minutes and the rate is charged on all minutes, that Verizon will over-recover its switch investment (WorldCom Reply Brief at 59).

WorldCom also recommends that the Department adopt a BH/AHD ratio of 7.3 percent instead of 8.3 percent because of the likely increase in dial-up Internet usage since the 1997 study was conducted (WorldCom Brief at 34). WorldCom contests Verizon's testimony that in 1995 the dial-up Internet usage "took off" and then as 2000 approached, the pattern shifted back toward ten percent as people subscribed to DSL lines and cable modems (id.). WorldCom contends that people continue to buy computers and to access the Internet through dial-up modems, and that such growth is not inconsistent with increasing growth of DSL and cable modem access (id. at 35). WorldCom contends that Verizon "used data from five years ago because it has every reason to believe that more recent data would further flatten out the busy hour" (id.). Observing that, in the context of GR-303 concentration ratios, Verizon states that "calling patterns of residential versus business usage are dissolving on a going-forward basis" and yet in this context of the BH/AHD ratio, Verizon contends that the flatter busy hour shown by the 1997 data is not returning to the earlier daytime spike, WorldCom contends that "Verizon will take whatever position is necessary to keep its costs high no matter how illogical, incongruous or contradictory" (WorldCom Reply Brief at 59, citing Verizon Brief at 80).

i. Intra-Switch Calls

WorldCom opposes Verizon's proposal to charge twice for an intra-switch charge, and, in support of its position, WorldCom points out that the Department rejected Verizon's request to do so in orders issued in D.T.E. 98-57 (WorldCom Brief at 39). WorldCom also states that Verizon has failed to support its proposed modification to its intra-switch charges (id. at 39-40).

4. Z-Tel

Z-Tel contends that the Verizon model has two "defects" with respect to switching: the calculation of per-minute rates and the choice of discounts applied to switching investment (Exh. Z-Tel-1, at 3-4). Z-Tel asserts that Verizon uses inappropriate discounts for switching investment (id. at 20-21). According to Z-Tel, the Verizon model uses "a discount level consistent with an embedded network," and understates the potential discount in a TELRIC scenario (id. at 21). Z-Tel notes that "incremental," in the context of TELRIC, "implies the change in total cost caused by providing the entire element, not the change in total cost required to maintain or upgrade an existing, embedded facility" (id. at 22). Further, Z-Tel emphasizes that costs in the long run are "variable and avoidable" (Z-Tel Reply Brief at 10, citing Local Competition Order at ¶ 12). Thus using growth discounts, Z-Tel maintains, is inappropriate because they are "based on short-run upgrades, rather than the fixed investment cost that varies in the long run" (id. at 10).

Z-Tel proposes a switching discount that is a weighted average of new and growth discounts, building on the foundation of the Megabid discounts (Exh. Z-Tel-1, at 22-23). If the choice of discount has to be one or the other, however, Z-Tel contends that the better choice would be the new discount (id. at 23). It is, Z-Tel concludes, "by far a more appropriate proxy for the average discount for switching equipment" (Z-Tel Reply Brief at 11, citing Exh. Z-Tel-1, Att. C, RR-DTE-100(b)).

Z-Tel asserts that Verizon understates total MOUs when converting investments to per-minute terms, because it excludes weekend and holiday traffic (Exh. Z-Tel-1, at 12). The rate ought to be calculated, according to Z-Tel, based on all minutes of traffic. Z-Tel observes that

"Verizon converts traffic sensitive switching costs into cost per business day MOU, not cost per total MOU" (id. at 13) (emphasis in original). Z-Tel concludes that "[w]hile it is appropriate to use busy hour traffic to size the switch and determine investment, the per-minutes rates should be determined by dividing the TELRIC cost by all MOU to which the rate will apply" (id. at 15) (emphasis in original). Z-Tel proposes that 308 business days be used in the calculation, which assumes that weekend and holiday usage is approximately half the business day usage (Z-Tel Reply Brief at 6).

B. Analysis and Findings

1. Overview

Verizon's switching TELRIC study computes monthly costs for non-traffic-sensitive UNEs such as ports and optional features, and MOU costs for traffic-sensitive UNEs such as originating and terminating end office and tandem usage. A wide gap separates Verizon's proposed costs for switching UNEs and those proposed by other parties. By way of illustration, Verizon proposes originating and terminating end office MOU costs of $0.002888 and $0.002533, respectively (RR-DTE-48[124]), in comparison with AT&T's proposed costs of $0.0000658 and $0.0000577, respectively (AT&T Brief at 65). The incorporation of Nortel competitive bid pricing information, which Verizon provided in response to a record request, significantly affects AT&T's proposed costs. If this more recent information is excluded from its analysis, AT&T proposes MOU costs of $0.0003133 and $0.0002749 for originating and terminating usage, respectively (id.). The calculation of the costs for switching UNEs depends

124 RR-DTE-48 consists of Verizon's electronic Revised Recurring Cost Study. The quoted values are found at Part C-2, Section 1.

on numerous decisions about methodology and inputs, including the classification of traffic-sensitive and non-traffic-sensitive costs; the discount for determining switch equipment prices; the mixture of new and growth equipment; the EF&I factor; trunk utilization; the call completion ratio; the RTU factor; the busy hour of the day conversion factor; and global assumptions such as those concerning depreciation, cost of capital and capital structure, and ACFs (Exh. VZ-37, Part C; Exh. VZ-39, Part C; RR-DTE-48, Part C).

2. Switch Material Prices

Verizon's switch cost study relies on material investments that Telcordia's SCIS model computes (Exh.VZ-36, at 131). The SCIS databases include manufacturers' list prices and the SCIS program includes discount inputs that are entered to compute a net price (Exh. ATT-20, at 9-10). The two fundamental decisions affecting switch material prices are the determination of the appropriate mix of new and growth switching equipment, and the appropriate vendor discounts.

The switch prices depend on the relative proportion of new and growth switching equipment that the study assumes and also on the specific vendor discounts used in the cost calculations. Verizon assumes that it will meet demand with additions to its existing switches rather than through the deployment of new switches and contends that its actual recent purchases provide the best information about its forward-looking switching costs. By contrast, AT&T contends that TELRIC requires the assumption of all new switches, and relies on data from Verizon's recent Nortel purchases as evidence of the appropriate vendor discount (RR-DTE-49).

To support its methodology, Verizon relies, in part, on its position that the FCC has "unequivocally" rejected the assumption of a new switch discount (Verizon Brief at 146). However, the Department is not persuaded that the FCC's guidance is as unambiguous as Verizon implies. In April 2001 in the Massachusetts 271 Order, the FCC interpreted TELRIC, as applied to switch costs, to reflect the discounts that could be obtained "if a carrier were building an entire network":

> Although questions have been raised regarding whether the Massachusetts Department will adopt TELRIC-based pricing on a going-forward basis, we note that Massachusetts' permanent UNE rates were adopted by the Massachusetts Department shortly after the passage of the 1996 Act and our rules implementing it. Since that time, there has been significant guidance on what constitutes TELRIC-based rates from this Commission, other state commissions, and the courts. States may benefit from the experiences of other states that have undertaken extensive pricing analyses. Additionally, circumstances have changed since Massachusetts prices were originally set in late 1996. New developments, technologies, and information, including information as to the kind of switch discounts that would be available if a carrier were building an entire network, have become available since that time. As always, we presume that the Massachusetts Department, like other state commissions, will examine these issues during the course of its ongoing rate case and set rates within the range of what a reasonable application of what TELRIC would produce.

Massachusetts 271 Order at ¶ 35 (emphasis added) (footnote omitted).

Also, the FCC recently provided further guidance on its application of TELRIC principles to switching UNE costs in its order approving Verizon's 271 application in Rhode Island:

> While the Commission has not to date specified an appropriate split between new, replacement switches and growth additions, we strongly question an assumption of only growth additions, as proposed by Verizon and incorporated in the April 11 rates adopted by the Rhode Island Commission. Even if some growth additions may be used in a forward-looking network, the absence of any new switches is inconsistent with the assumption in TELRIC pricing of a forward-looking network built from scratch, given the location of the existing wire centers. Although an efficient competitor might anticipate some growth

> additions over the long run, rates based on an assumption of all growth additions and no new switches do not comply with TELRIC principles. We also note that the Rhode Island Commission determined that Verizon's assumptions for switch cost recovery in the new UNE rate proceeding will be based on a rebuttable presumption of 90 percent new switches to 10 percent growth additions.

Rhode Island 271 Order at ¶ 34 (footnotes omitted). Therefore, contrary to Verizon's characterization of FCC guidance, the FCC has recently and clearly directed the use of a network that includes some new switches.

We turn now to the analysis of the appropriate blend of new and growth equipment to assume in a forward-looking cost study. If we adopt a "melded" discount price, the issue before us is the appropriate methodology for blending new and growth equipment. Verizon suggests that its actual purchases over a recent five-year historical period should inform our decision (RR-DTE-66). AT&T suggests that we model a network with all new switches and then look forward over a planning period to determine growth equipment that would be deployed based on Verizon's anticipated line growth (RR-DTE-56).

Verizon recommends the switch prices as it proposed them in its original filing, but if the Department instead adopts a blend of new and growth switches, it recommends an assumption of 50 percent new switches and 50 percent growth switching equipment, a mixture that Verizon characterizes as a "life cycle discount" (Verizon Reply Brief at 56). Verizon's argument that no carrier "operating in the real world would place an entire network of new switches instantaneously" (id. at 57), however, does not bear on TELRIC methodology, because, TELRIC is in fact based on the assumption that a network is "dropped in place." In its response to a Department record request, Verizon prepared an alternative "life-cycle" cost analysis in which it developed an alternative lower discount for Lucent switching equipment

(RR-DTE-66). Its historical analysis indicates that, over a five-year period, Verizon purchased approximately half of its lines as part of new switch purchases and approximately half of its lines as upgrades and additions to existing switches (id.). Based on this ratio, and limited additional proprietary analysis, Verizon computes a discount for Lucent equipment that is lower than the proposed discount shown in its original cost study (Exh. VZ-36-D-P; Exh. VZ-36, Part C-P1, Part C-P2). Verizon asserts that this incremental approach is superior to the 90/10, new-to-growth ratio analysis of AT&T/WorldCom (Verizon Reply Brief at 57). Stating that no party "challenged the discount level proposed by Verizon MA for Nortel equipment," Verizon's analysis in its proprietary attachments is limited to Lucent equipment (RR-DTE-66).

Although Verizon's analysis in RR-DTE-66 is a more reasonable model of forward-looking costs than the limited analysis provided in Verizon's original cost study, it is nonetheless flawed for several reasons. First, as WorldCom observes, the analysis is cursory and does not permit one to determine, for example, whether growth occurred relative to a three-year-old switch or to a seven-year-old switch. The latter instance should be excluded, because assuming a dropped-in-place network, the analysis, which spans five years, should not include any switches that are more than five years old. The analysis captures a five-year snapshot of the portion of Verizon's embedded network that corresponds with one of its two suppliers rather than being based on the deployment of all new switches with growth then occurring over a set period. The first year of the study period, 1996, includes a combination of new and growth switches rather than entirely new switches.

By contrast, the analysis presented in RR-DTE-56 is based on a more appropriate foundation for a TELRIC analysis; namely, the assumption that in the first year, the model deploys all new switches and then, in subsequent years, growth is added to accommodate forecast demand. This assumption is more appropriate because it describes the "dropped in place" nature of a TELRIC-modeled network. Furthermore, the forecast data provided in Exh. ATT-VZ 4-29-2S, Att.-P at 3 support an assumption of a 1.5 percent line growth during the planning period. In response to RR-DTE-56, upon which the Department relies in order to determine the appropriate percentages of new and growth switch equipment, AT&T assumes that new switches are deployed in the first year of the analysis to accommodate all existing access lines, and then, that over a 15-year period, growth equipment must be added to accommodate projected future growth in access lines. Based on the relative percentages of lines that are served by new switches, (i.e., existing demand) and lines that are served by growth equipment (i.e., future demand) the analysis yields a blend of 90 percent new switches and ten percent growth switch equipment. Furthermore, using an estimated annual access line growth of 1.5 percent results in relatively less growth equipment being deployed over the study period than results if one uses the higher growth of three percent, which AT&T uses in its response to RR-DTE-56.[125] Accordingly, Verizon must use a blend of 90 percent new switches and ten percent growth switches in its compliance switch cost study.

We are not persuaded by Verizon's argument that its actual year 2000 purchases of Lucent switching equipment and its contract price for Nortel switching equipment are reasonably representative of forward-looking efficient switching costs (see Exh. VZ-36-D). In

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125 In its calculation of the discounted values of the relative percentages of new lines and existing lines, AT&T uses its proposed cost of capital. If, instead, the Department-approved cost of capital is used, the relative percentage of new lines increases only slightly. AT&T's calculation also assumes a 15-year study period. Shortening the length of the study period increases the relative percentage of new lines.

reaching this conclusion, we realize that we are, in part, departing from our finding in 1996, in which we stated that "it is speculative to assume what the manufacturers' discounts would be if a TELRIC network were being constructed today" and further stated that "[s]uppliers' discounts are a function of both supply and demand in the marketplace" and thus concluded that NYNEX's proposed switching investment to be "reasonable and appropriate for use in its TELRIC model." Phase 4 Order at 37. Unlike the earlier proceeding, the record in this proceeding is far more comprehensive, and thus less speculation is necessary to determine the appropriate discounts.

Now we turn to the determination of the appropriate prices for new and growth equipment. Verizon purchases switch equipment from Lucent and Nortel at prices that are discounted off of list prices. Verizon's cost study assumes the same ratio of Lucent 5ESS and Nortel DMS 100 switching equipment as is present in its existing network (Exh. VZ-36, at 131). The record indicates (see RR-DTE-49-S; RR-DTE-65-P; RR-DTE-66; Exh. VZ-37, Part CP-1, Part CP-3) that the two vendors' discounts may differ, and thus we shall address them separately. First, however, we will address AT&T's argument that a rational buyer would purchase only from the lower-cost supplier, which would imply that only the price of the lower-cost supplier need be determined. The Department must consider whether the Nortel price is the appropriate value to use for all switches in Verizon's network, as AT&T contends, or whether two separate suppliers' prices should be assumed, as Verizon contends. The long-term goal of retaining supplier diversity to avoid monopoly in the market has greater merit than the short-term goal of purchasing all equipment from the lower-cost supplier. Therefore, contrary to AT&T's recommendation, we approve Verizon's use of the existing mix of Lucent 5ESS and Nortel DMS 100 switches for the purposes of the TELRIC study.

Verizon's original proposed Lucent discount, which has been based on Verizon's actual purchases from Lucent during the year 2000 for the thirteen-state Verizon-East territory (Exh. VZ-36, at 152-153; Exh. VZ-37, Part CP, Part CP-1, Part CP-2; Exh. VZ-38-A, at 59-60; Tr. 8, at 1674-1678; Tr. 12, at 2363-2367). Verizon East includes that portion of the Verizon territory previously served by Bell Atlantic. In the year 2000, of 1,740 Lucent switches throughout this territory, two were new switches and the balance were existing switches, and thus the vast majority of the switch equipment purchases made in this year for Lucent equipment were for growth (RR-DTE-64; RR-DTE-66, Att.2-P; Exh. VZ-38-P, at 59-62). Based on these data, the approximate cost per line served by Lucent equipment is $157.87 (Tr. 8, at 1591-1593). However, equipment purchases made in a single year are not a reasonable basis upon which to model forward-looking switching prices and thus the basis of Verizon's assumed discount for Lucent equipment is inappropriate for its TELRIC study. Verizon's assumed discount for Lucent is based on a single year in which a negligible portion of the purchases was for new equipment. Had new switches accounted for a larger percentage of the study year's purchases, the discount off of the list price would likely have been far greater than shown in the one-year analysis conducted by Verizon. Therefore, it would be unreasonable to rely on the data submitted by Verizon with its original cost study in order to determine the appropriate discount for new Lucent switches (Exh. VZ-37, Part CP, Part CP-1, Part CP-2).

In its response to RR-DTE-66, Verizon uses an alternative "new" switch discount for Lucent, and although the context of its representation suggests some skepticism by Verizon about that value, we observe that this analysis was prepared by or on behalf of Verizon, and thus if Verizon was aware of a more accurate value, it should have used such a value in its analysis. Furthermore, the discount that Verizon used in its own analysis is consistent with other data provided by Verizon on prices that Verizon paid for new Lucent switches in the year 2000 (RR-DTE-65-P). Therefore, for the new Lucent equipment, Verizon shall use the discount shown in Attachment 1, line 2 of RR-DTE-66. Because 99.7 percent of the Lucent investments in 1998 were associated with growth equipment, it is reasonable for Verizon to use the Lucent discount shown in Exh. VZ-37, Parts CP, CP-1, and CP-2, for the Lucent growth equipment, and Verizon is directed to so in its compliance filing (Tr. 11, at 2066).

Verizon's proposed Nortel discount is based on current contracts (Exh. VZ-36, at 152-154; Exh. VZ-37, Part CP, Part CP-1, CP-3; Tr. 8, at 1677-1679). The approximate cost per line served by Nortel switches, based on the discounts Verizon used in its proposed study, is $82.62 (Tr. 8, at 1591-1593). However, as AT&T argues, these contracts may overstate the price that Verizon actually pays for Nortel switches. AT&T sought information from Verizon in May 2001 regarding prices paid for new switches, but Verizon did not provide the information, contending that the request was "overly broad and burdensome" (Exh. ATT-VZ 12-19). AT&T's witness, Ms. Pitts, testified that the contract prices, used by Verizon as an input in its cost study, were conservatively high because Verizon can obtain higher discounts through competitive bidding than the discounts incorporated in its contract with Nortel (Tr. 11, at 2061-2062). In February 2002, in response to a Department record request, Verizon supplied Verizon-VA's response to FCC RR-VZ-VA-32, providing information for the first time on the discounted prices that it paid for new Nortel switches (RR-DTE-49-S). However, Verizon contends that these discounts cannot be relied upon in isolation. According to AT&T, the new data show that the Nortel switching prices per line, for new switches, is $17.57 (AT&T Reply Brief at 55-56, citing RR-DTE-49-S).

The substantially lower cost of Nortel switches shown in Verizon's proposed cost study undermines Verizon's reliance on Lucent switch costs in a forward-looking efficient cost study. Furthermore, as Verizon indicates, if it were to purchase one or more switches, it would not do so under contract but rather would do so through competitive bid procedures (RR-DTE-49-S). The record includes proprietary information on Verizon's purchase, through competitive bidding, of Nortel equipment, which shows discounts substantially below even the contract-based discount that Verizon incorporates in its study (id.).

AT&T raises concerns about Verizon's responsiveness to discovery requests on switching prices. As AT&T correctly points out, AT&T sought switch pricing information in Exh. ATT-VZ 12-19, submitted in May 2001, and yet Verizon did not provide complete information directly relevant to the issue of Verizon's Nortel switch prices until it responded to RR-DTE-49-S in February 2002.

We will first address the relevance of the Nortel competitive bidding process. We are persuaded by Verizon that it would be inappropriate to rely on the information provided in RR-DTE-49-S because the discount that AT&T recommends is not the effective overall discount achieved in the bid. We note that although Verizon faults the price that AT&T infers from RR-DTE-49-S, Verizon does not offer a revised figure but simply states that with appropriate adjustments, the Nortel bid price would be "much higher" than a proprietary figure indicated in its brief, but does not indicate what this higher figure would be (Verizon Reply Brief at 67).

Verizon explains that “the bid result cannot be used as the basis for a forward-looking valuation of Verizon MA’s entire local switching investment” (id. at 68). We are persuaded by Verizon’s argument. Although the evidence suggests that the competitive bidding process might yield a lower price than the contract price that Verizon incorporates in its TELRIC filing, there is not a sufficient record to support this conclusion (Tr. 11, at 2061-2062; RR-DTE-49-S). Therefore, the Department approves the discount that Verizon proposed for Nortel-supplied new and growth switching equipment (Exh.VZ-37, Part CP, Part CP-1, Part CP-3).

Verizon also raises the economic concern that the instantaneous replacement of switches would actually increase vendors’ price and decrease the supply. In support of this position, Verizon relies on the Bridgestone/Firestone tire recall, in which, as a result of needing to replace 6.5 million tires simultaneously, Firestone’s cost per tire was higher than it would have been had tires been replaced gradually under normal circumstances (Verizon Brief at 147). Verizon has not demonstrated that Nortel and Lucent would confront a similar difficulty in meeting an order for the several hundred new switches in Massachusetts. Furthermore, as AT&T indicates, Verizon’s Bridgestone/Firestone argument, if correct, should apply to all aspects of its TELRIC studies and thus, Verizon should be arguing, for example, for increases in its estimated cost of fiber and copper cable. Verizon makes no such argument. Finally, if Verizon were to order several hundred new switches simultaneously, the cost per switch could result in lower per-switch prices than those we direct in this Order. We are not persuaded, therefore, by Verizon’s argument.

Finally, if the TELRIC study models primarily new switches, Verizon claims that the TELRIC study must include an additional $2 million per switch for RTU costs (Exh. VZ-38, at 77; Tr. 12, at 2404). Verizon's estimate of the RTU cost is based on data provided in the Consolidated Arbitrations (Exh. VZ-38, at 77). Verizon estimates a per-line cost of $59 based on demand of 4,500,000 lines, and 133 host end offices (Verizon Reply Brief at 65). Verizon indicates that it "did not attempt to estimate the cost of the initial switch software packages," but instead relies on cost estimates from other proceedings (Exh. VZ-38, at 77). Verizon has failed to substantiate its assertion that the assumption of 90 percent new switches requires any increase in RTU costs, and therefore its compliance filing shall not include any additional RTU costs.

3. "Getting Started" Costs and EPHC

Verizon proposes to assign approximately $302 million of switching investment to the non-traffic-sensitive category and approximately $310 million to the traffic-sensitive category (Exh.VZ-37, Part C-2, Section 4, Workpaper at 1). Approximately $176 million, or more than half, of the latter category includes "getting started" costs, a category of costs that several parties suggest should be assigned instead to the non-traffic-sensitive category (id.). Getting started costs are for common equipment that makes a switch operational (Exh. VZ-42, at 10). Verizon contends that the ultimate limiting resource for the central processor is "real time" and that, in the long run, getting started investment is traffic-sensitive (id. at 10-14). Where the central processor is not expected to exhaust, Verizon asserts that the investment should be considered as "shared fixed" (id. at 12).

The duration of the planning period assumed in the switching cost study is related to the analysis of this issue because the planning period determines the volume of traffic that the hypothetical switches will serve (Tr. 12, at 2351). Verizon uses a three-year planning period to compute MOU costs (Exh. VZ-37, Part C-2, Section 4, Workpaper; Tr. 12, at 2351). Verizon stated that, even if the planning period were five years, rather than the proposed three years, getting started costs would not increase although traffic in MOU and investments would increase (Tr. 12, at 2351). Therefore, if a five-year planning period were used rather than a three-year planning period, the amount of the investment in the category that Verizon identifies as traffic-sensitive material investment would increase to accommodate the additional traffic but that increase would not include any change in the amount of the getting started cost (Exh. VZ-37, Part C-2, Section 1, Workpaper at 1, line 1; Tr. 12, at 2351-2355).

Neither the evidence nor common sense would suggest that growth in switching demand will cease after the end of the three years modeled in Verizon's cost study. Therefore, if the costs that the Department establishes in this proceeding serve as the foundation for rates that are effective for five years (i.e., until such time as the Department examines TELRIC studies for UNEs again), for the period of time between the end of the three years, and the completion of the next review of UNE rates, Verizon's proposed MOU costs would be based upon a mismatch of costs and demand. By assigning the getting started costs, which do not vary with usage, to the traffic-sensitive category, and then dividing those costs by three years of demand, Verizon would, after three years have ended, still be charging MOU costs for demand that it excluded from its calculations. This outcome is economically inefficient and unfair.

The Department could remedy this situation in two ways. We could more closely match the period of time that Verizon's rates are effective with the demand projection. However, as is discussed in Section XII, below, the Department does not adopt the Attorney General's recommendation to review TELRIC cost studies again in three years. Therefore, to align demand estimates with the associated five-year time period would require Verizon to re-run its SCIS in order to project five years forward rather than three years. Using Verizon's same methodology, Verizon would then determine the mid-cycle of this five-year period and would also need to determine the necessary investment to meet that revised demand estimate (Tr. 12, at 2353-2354). We are reluctant to direct such a modification, as it would necessitate a new review of multiple aspects of Verizon's switching cost model, and more importantly because it does not address the underlying flaw in the cost assignment methodology.

A second way to remedy the inefficiency in Verizon's proposal would be to assign getting started costs to the non-traffic-sensitive category of investments. The widespread deployment of digital switches, equipment that is similar to computers, with vast processor capacity, has changed the nature of switching costs. We are not persuaded by Verizon's argument that the reason that usage does not cause the need for additional getting started investment results from the evolution of the switch. Switches may well have evolved specifically to accommodate capacity with sufficient processor capacity for the anticipated usage, but in a forward-looking cost study, contrary to Verizon's assertion, usage is not truly the cost driver for getting started and EPHC investments. The average processor utilization of Lucent 5ESS and Nortel DMS switches demonstrates that ports rather than processing capacity limit digital switches (Exh. ATT-20-P, exh. CP-4).

The assignment of getting started and EPHC costs to non-traffic-sensitive UNEs is methodologically superior for several reasons. As a cost causation matter, because an increase in MOU does not cause an increase in getting started costs (unless Verizon needs to deploy another switch), it is inappropriate to assign these costs to the traffic-sensitive category. Furthermore, this issue is also related to our analysis of reciprocal compensation, discussed in Section VII.C.2. As we describe in more detail below, although Verizon proposes to assign getting started and EPHC costs to the MOU costs it would charge its competitors, it does not propose to assign these same costs to the reciprocal compensation that it would pay its competitors. The different treatment of the same category of costs is both inconsistent and unfair. For the reasons discussed above, we direct Verizon to assign getting started costs to the non-traffic-sensitive category. With this modification, the prices that Verizon ultimately sets, based on the studies in this proceeding, will more accurately signal the underlying cost of switching traffic. Verizon's concern that low-volume users will then subsidize high-volume users is unpersuasive; and it is certainly of far less concern than that under Verizon's proposal, wherein all users would subsidize Verizon for the entire period of time that the rates are in effect beyond three years.

4. Trunk Utilization

Intervenors dispute two aspects of Verizon's calculation of its proposed digital trunk utilization. One contested attribute concerns the appropriate level of busy hour traffic to assume in a forward-looking cost study. There are 3600 seconds or 36 CCS in an hour, and thus, for example, a utilization rate of 50 percent would be equivalent to 18 CCS per busy hour. Based on the Neil-Wilkerson Table, Verizon assumes 15.88 CCS per trunk and 14.55

CCS per trunk for 5ESS and DMS-100 switches, respectively (Tr. 11, at 2075; Exh. VZ-37, Part C-3, Section 4, Workpaper at 2). By contrast, AT&T recommends that the trunk utilization be set at a minimum of 20 CCS per busy hour and as high as 27 CCS per busy hour, referring to the figure of 27.3 CCS per trunk from the Erlang B Table[126] (Exh. ATT-20, at 25, 25 n.24; Exh. DTE-6). As of November 1, 2001, carriers and CLECs used approximately 62 percent of Verizon's trunks for interconnection (Exh. VZ-38, at 62). Thus, although a higher level of CCS per trunk could be assumed without jeopardizing the quality of service, as measured by the percentage of blocking that occurs, Verizon cannot control the level of traffic that carriers send over their trunks, and, accordingly, we approve Verizon's assumed levels of CCS per trunk (Exh. VZ-38, at 62; Exh. DTE-6).

Another disputed aspect of Verizon's calculation concerns the trunk utilization factor, which incorporates assumptions about administrative spare and breakage (network components come in specific capacity increments which rarely coincide with actual demand). AT&T recommends that, to avoid duplicative counting of spare capacity in the SCIS model and in the cost study workpapers, Verizon change the proposed utilization factor of 94.28 percent to 100 percent (AT&T Brief at 83). AT&T's recommendation appears to be based upon a utilization factor that Verizon no longer proposes. As a result of corrections filed in December 2001, Verizon is now proposing a trunk utilization factor of 116.90 percent, a level that exceeds AT&T's recommended level of 100 percent, and thus AT&T's specific recommendation appears moot although its concern about possible double-counting merits consideration. In

126 The Neil-Wilkerson and Erlang B tables are reference tables that engineers rely on in order to estimate trunk sizing based on traffic volumes (Tr. 11, at 2073-2078).

revisions to its original cost study, submitted in December 2001,Verizon increased the proposed end office utilization trunk factor from 94.28 percent to 116.90 percent (Exh. VZ-37, Part C-1, Section 38, Workpaper at 4; Exh. VZ-39, Part C-1, Section 38, Revised Workpaper at 4). Verizon stated that it corrected the utilization adjustment factors to reflect the average number of lines and/or trunks per office (Exh. VZ-38, at 82).

Verizon's delay in filing corrections to its proposed TELRIC studies may have contributed to AT&T's reliance on superseded data in its initial and reply briefs. Verizon modified the data it uses to compute its proposed trunk utilization on August 1, 2001, but did not bring this and other modifications to the parties' and to the Department's attention until more than four months later (Exh. VZ-39). Had Verizon alerted parties in August of this and other changes, when Verizon originally corrected its proposed cost study, parties' witnesses could have addressed them in their surrebuttal testimony. This oversight is unfortunate but does not prevent the Department from addressing how the intervenors' arguments bear on the revised cost study. Furthermore, Verizon's identification of its changed trunk utilization factor in its surrebuttal testimony mitigates our concern because it afforded parties the opportunity to explore the implications of this change during the evidentiary hearing (Exh. VZ-38, at 82).

Having considered the implications of Verizon's delay in filing corrections to its TELRIC cost study, the Department will now consider whether Verizon's cost methodology prevents double-counting of spare capacity, which appears to be the basis of AT&T's concern. Verizon's calculation of the trunk utilization factor is based on, among other things, an assumed administrative fill factor of 95 percent and an average fill factor of 90 percent (Exh. VZ-39, Part C-1, Section 38, Revised Workpaper at 4). Verizon indicates that the average fill factor includes administrative spare (Exh. VZ-38, at 64). Also, the SCIS model requires an input assumption for the administrative fill for trunks, which, Verizon states, concerns the number of utilized trunks versus the number of spare trunks (id. at 63). Verizon also increased the average utilization to account for equipment breakage in SCIS (id. at 64).

The question is whether Verizon's study double counts spare capacity as AT&T contends or includes one "thorough" counting as Verizon contends. We turn first to Verizon's assertion that AT&T used the wrong number from the wrong worksheet, and then we will address Verizon's claim that AT&T misunderstood the function of the proposed utilization factor. As discussed above, Verizon revised its cost study and yet AT&T, in its initial and reply brief, refers to data in Verizon's original cost study, and thus we concur with Verizon that AT&T relied on outdated information in the analysis in its briefs.

To address AT&T's second point, we turn to Verizon's worksheets in its cost study, which provide additional information about the utilization factor's function. As proposed by Verizon, the utilization factor is: [(proposed average fill factor) ÷ (breakage adjustment fill factor) x (administrative fill factor)] (Exh. VZ-39, Part C-1, Section 38, Workpaper at 4). Verizon multiplies this resulting trunk utilization factor by the material investment for the port to yield the "adjusted material investment" which, after several subsequent calculations, yields Verizon's proposed end office trunk port charge (id., Part C-1, Section 5, Workpaper at 1). The source of the material investment is the SCIS model (id., Part C-1, Section 39, Workpaper at 1). The SCIS model includes as one of many inputs, administrative spare of five percent (Exh. VZ-38, at 63).

According to Verizon, because the SCIS already accounts for five percent spare capacity, and because the assumption of an average 90 percent trunk utilization also includes administrative spare, Verizon increases the assumed average fill through its modifications to eliminate the redundancy (Exh. VZ-38, at 64). As described above, through its derivation of the trunk utilization factor, Verizon eliminates the double-counting of the spare that is present in the average fill factor, and thus the record indicates that Verizon only accounts for administrative spare in the SCIS model. Verizon indicates that the typical trunk addition provides approximately ten percent added capacity and that it is reasonable to expect an average trunk DS1 utilization of 90 percent based on Verizon's expectation that at any given time, capacity has just been added to some trunks and other trunks are close to the 95 percent fill that would trigger added capacity (Exh. VZ-36, at 155).

Verizon's description and justification for its proposed trunk utilization, recounted above, are persuasive. Accordingly, we find that Verizon's trunk utilization factor of 116 percent combined with its use of 95 percent fill in the SCIS model reasonably accounts for breakage, administrative fill, and average fill.

5. Feature Port Additive Costs

Verizon proposes monthly feature port additive costs that, for individual lines, range between $0.03 (for anonymous call rejection) and $1.48 (for remote call forwarding) (Exh. VZ-39). AT&T's witness Ms. Pitts restates costs for feature port additives that incorporate the effects of her recommended adjustments to the switch investment and to the EF&I factor, but that do not incorporate any adjustment that corresponds to her concern about the inputs used to compute the feature port additives (Exh. ATT-20; Tr. 11, at 2078-2079).

Verizon's support for its proposed feature port additive costs is minimal, consisting of a description of a meeting between a cost analyst and a product manager in which the cost analyst recorded the input value as estimated by the product manager (Exh. ATT-VZ 4-1-S). Verizon, in choosing input values, could have, but apparently did not, rely on an analysis of data on penetration and usage of features (Tr. 11, at 2080-2082). Verizon instead requests that the Department rely on the scarcely documented opinion of its product managers in order to reach a finding that the input values for the SCIS feature model, called SCIS/IN, are reasonable. Furthermore, Verizon was not forthcoming about even this minimal level of support, as it did not respond to AT&T's original request for supporting documentation. The information provided in Exh. AT&T-VZ 4-1-S was provided solely as a result of the Department's directive to supplement the original non-response. October 18 Interlocutory Order at 27. Verizon apparently did not seek to gather pertinent data such as on the quantity of lines in its offices that subscribe to optional features, nor is there any further explanation of the product managers' estimates of the values that they recommended be used as inputs to SCIS/IN.

Verizon's concern that WorldCom and AT&T did not provide either an independent study of their own or provide evidence to refute Verizon's costs is unpersuasive. As we discuss in Sections II and III, Verizon must meet its burden of proof, irrespective of the evidence that other parties present. Verizon was afforded ample opportunity to explain and to justify the basis of the input values that it used to compute feature port additives but failed to substantiate these inputs. Therefore, Verizon shall eliminate the feature port additive costs from its cost study.

6. EF&I Factor

Intervenors have raised reasonable concerns about the sufficiency of Verizon's support for its proposed EF&I factor and have also developed a plausible alternative factor. Therefore, the Department must address the threshold question of whether Verizon has met its burden of proof for this component of its switch cost study. Verizon's filing lacks detail about the underlying components of the EF&I factor, and instead Verizon provides only generalized support for its proposed value. Neither the parties nor the Department can analyze the specific relationship between individual switches and their associated investment because, among other things, the DCPR data are not disaggregated by project (Exh. ATT-20, at 41; Tr. 11, at 2119-2120). Project-specific data would allow an analysis of: (1) whether the 1998 projects are representative of forward-looking investments; and (2) the installation costs of specific projects. This lack of detail hinders the Department's evaluation of whether Verizon's proposed EF&I factor reasonably represents its forward-looking cost of installing switches. We are not, per se, opposed to relying on Verizon's actual investment experience as a way to determine a forward-looking EF&I factor, but Verizon has failed to meet its burden of proof. Parties are unable to examine the information on a project-specific disaggregated basis and instead have been asked to accept that the sheer magnitude of the Verizon-East 1998 purchases renders the EF&I factor reasonable.

Verizon had ample opportunity to meet its burden of proof. AT&T sought information in May from Verizon on its DCPR, and, in its original response, Verizon objected to the burdensomeness (see Exh. ATT-VZ 14-10). Subsequently, in response to a Department directive, Verizon provided details related to ten equipment installations completed in

Massachusetts in 1998 (October 18 Interlocutory Order at 27; Exh. ATT-VZ 14-10-P). However, these data are aggregated and thus do not enable a project-specific analysis.

Verizon cites to a portion of the transcript in support of its assertion that it "has provided full documentation of the data supporting its proposed EF&I factor" (Verizon Brief at 161, citing Tr. 12, at 2553-2553). Unfortunately, Verizon's citation is clearly not the intended reference because it refers to a single-page portion of the transcript that does not concern its EF&I factor. However, the Department, in its examination of Verizon's support, has reviewed the record, and nonetheless finds the support insufficient. Verizon also refers to AT&T's proprietary EF&I figure in support of Verizon's own proposed factor. The information provided in Exh. VZ-ATT 1-70 is of limited value because the underlying sample size is limited and, of greater significance, because it is not associated with the costs that either Verizon or another ILEC confronts.

In support of its proposed factor, Verizon refers to proprietary cost data about its six most recent switch replacement jobs, and contends that this analysis yields an EF&I factor substantially higher than Verizon's proposed factor in this proceeding (see RR-DTE-49). Rather than supporting Verizon's proposed factor, we find that this evidence underscores the sensitivity of the EF&I calculation to the nature and size of the particular projects undertaken. The specific data have been afforded proprietary treatment and thus will not be discussed here. Because Verizon was unable to provide a level of detail for its 1998 installations similar to that provided in response to RR-DTE-49, the Department lacks the information upon which to conduct an analysis of the disaggregated components of Verizon's EF&I proposed components. The Department has no way to ascertain whether the particular composition of switch investments in 1998 reasonably represent the likely forward-looking composition, and intervenors have raised legitimate concerns about the use of the DCPR database for computing the switching EF&I.

Having concluded that Verizon has failed to justify its proposed factor, we will look to the record for an alternative, reasonable value. The record provides information on the three components of the EF&I: the vendor component, the ILEC component, and the sales tax. By running SCIS in two different modes, one with "material-only" and the other in an "EF&I mode," AT&T compared the two results to determine the percent associated with the vendors' engineering and installation, and the comparison yielded a vendor cost of twelve percent (Exh. ATT-20, at 40, exh. CP-7; Tr. 11, at 2113-2114). The source of this vendor component is the SCIS model that Verizon proposes to use to compute switching vending costs. Furthermore, Verizon does not dispute AT&T's representation that the SCIS model computes this value. Therefore, we find this is a reasonable figure to use for the vendor component of the EF&I factor.

The record includes two different sources for the ILEC component of the EF&I factor. One source recommended by AT&T is the FCC's finding in its USF proceeding in 1999 in which it adopted a value of eight percent. Inputs Order at ¶ 307. AT&T also refers to data submitted by ILECs in the FCC's 1992 Open Network Architecture ("ONA") proceeding, specifically data submitted by one of Verizon's predecessor companies, Bell Atlantic, and also by Bell South and Southwestern Bell (Exh. VZ-ATT/WCOM 1-6; RR-DTE-58). We choose not to rely solely on the finding in the FCC's USF proceeding, because we are not persuaded by the underlying rationale. The record also includes specific information about ILECs' representations as to their EF&I factors. In its Initial Brief, AT&T characterizes the figure of ten percent as reported "by the old NYNEX and Bell Atlantic in the FCC's 1992 Open Network Architecture proceedings"; however, AT&T supplied data only for Bell Atlantic and not for NYNEX (Exh. VZ-ATT/WCOM 1-6; RR-DTE-58).

The information for Bell Atlantic's factors for engineering and labor costs range between 8.6 percent (Delaware and Pennsylvania) and 15.6 percent (Maryland), based on the 1992 filing with the FCC in Docket 92-19 (RR-DTE-58, at 3, line 4). We will use the approximate midpoint of the Bell Atlantic interval, that is, twelve percent, as the ILEC component. We consider but reject the use of a simple average of the seven values shown for Bell Atlantic because such an approach would afford the same weight to all jurisdictions, regardless of the access lines, and we reject the use of a weighted average because it would imply greater precision than the data warrant. The value of twelve percent is a reasonable value supported by RR-DTE-58, Exh. VZ-ATT/WCOM 1-6, and the FCC's Inputs Order.

Verizon indicates that the use of 1992 data "certainly cannot be relevant" and states further that installation costs "do not vary with investment amounts in a linear fashion" (Exh. VZ-38, at 75-76) (emphasis in original). Rather than use the 1992 data from the FCC's ONA proceeding, we could rely on the FCC's more recent determination of eight percent rendered in its Inputs Order, issued in 1999, but we prefer to rely more specifically on data submitted in this proceeding rather than to rely solely on a finding in another jurisdiction. Also, contrary to Verizon's assertion, it would be inappropriate to rely on a single data point concerning AT&T's purchase and installation of one switch in Massachusetts (Exh. VZ-ATT 1-70-P; Exh. RR-DTE-49).

The five percent sales tax is not in dispute. As is explained above, although the FCC's Inputs Order is more recent than the 1992 data, we prefer in this instance to rely on data that are specific to Verizon's predecessor companies, and thus we rely on the higher figure of 12 percent for the ILEC component. Therefore, we reduce Verizon's proposed EF&I factor of 1.4027 (Exh. VZ-37, Part G-3, Workpaper 8) to 1.29 (i.e., the sum 12% + 12% + 5%).

In Sections VI.B.6 (DLC Cost Inputs) and VIII.C (IOF Equipment In-Place Factor), herein, we address the EF&I for DLC equipment and interoffice equipment, respectively. Our findings in these sections, and in particular, our willingness to rely on the 1998 DCPR as a way to validate Verizon's proposed EF&I factors, differs among these sections of our Order because of the differing records and specific alternative proposals propounded by intervenors.

7. Call Completion Ratio

Two critical components of the NCT factor are the amount of the non-conversation time per call attempt, which is expressed in minutes and the call completion ratio (Exh. VZ-37, Part C-3, Section 6, Workpaper, lines 13, 14). Verizon's source for both of these elements is a 1992 study, the Call Setup Analysis, a system that Verizon no longer maintains (Exh. VZ-37, Part C-3, Workpaper; Exh. AT&T-VZ 4-49-S; Tr. 12, at 2309-2310). Parties contest Verizon's proposed call completion ratio.

The telecommunications industry has evolved significantly during the last decade since Verizon conducted the supporting study, and thus the Department concurs with AT&T that a 1992 study on this attribute is unacceptably out-of-date, and thus cannot be found to be accurate. Verizon inappropriately faults AT&T and WorldCom for failing to produce studies of their own (Verizon Brief at 161). The fact that the 1992 study provides the most recent empirical data is not a reason to rely on that data when the evidence is strong that the evolving nature of telecommunications traffic has most likely changed attributes of the network's usage. For example, the Internet has changed calling patterns. In the intervening decade since the study was completed, the growing integration of telecommunications services and equipment into households and businesses has changed the characteristics of calls switched by Verizon. We concur with AT&T and WorldCom that the widespread deployment of answering machines and voice mail has increased significantly the percentage of calls that Verizon completes. Verizon recognizes that answering machines would likely cause the call completion ratio to increase since 1992 (Tr. 12, at 2315). Without answering machines, certain calls would necessarily go unanswered; that is, they would not be completed. As these technologies have become more widespread, more calls will necessarily be completed than they would absent the widespread deployment of these technologies. We also concur with WorldCom that the significant residential penetration of call waiting also likely drives up the percentage of completed calls (Exh. ATT-VZ 22-3-P).

Furthermore, we are not persuaded by Verizon that the use of caller identification reduces the number of calls completed. In some instances, people may choose not to pick up the handset when viewing the sources of certain incoming calls. Equally likely, however is that these calls, or some percentage of these calls, roll over to answering machines and thus, although they may not be answered by "live" bodies, are nonetheless completed. Verizon also points to call blocking in support of its call completion ratio, but, as is the case with caller identification, provides no empirical support for its analysis.

Verizon's original documentation and support for this factor consist solely of a reference in its cost study to "Call Setup Analysis" (Exh. VZ-37, Part C-3, Section 6, Workpaper at 1). On May 11, 2001, in response to an information request seeking "supporting documentation for the non conversation time factor," Verizon indicated that the development of this factor could be found in its cost study (see Exh. ATT-VZ 4-49, Part C-3, Section 6, Workpaper at 1). The portion of the cost study that Verizon references is simply the original source that states "Call Setup Analysis." This response, thus, provided no support other than that which Verizon had provided in its original filing. In response to the Department's October 18 Interlocutory Order, Verizon supplemented its response, and indicated, for the first time, that the call completion ratio was produced by the Call Setup Analysis System based on 1992 data, and, furthermore, that Verizon no longer uses this system, nor is the system available (Exh. ATT-VZ 4-49-S).

Not until the hearings did Verizon indicate that it is developing a Subscriber Line Usage Study ("SLUS") System that will collect telephone calling pattern data, including, among other things, data that can be used to develop a state-specific call completion ratio (Tr. 12, at 2310; RR-DTE-60) (see Exh. VZ-37, Part C-3, Section 6, Workpaper at 1, line 14). SLUS is scheduled to be completed for Massachusetts by the third quarter of 2002. Thus, Verizon apparently may have access to data in the near future that could provide empirical information relevant to this contested aspect of its cost study.

Data relevant to the other element, i.e., to the NCT factor (Exh. VZ-37, Part C-3, Section 6, Workpaper, line 13), which is the number of non-conversation time in minutes per call attempt, will not be available in the SLUS (RR-DTE-60). Verizon indicates that the development of a new system to collect data at specific switches on NCT "would be complicated and time consuming" and that that "it would require capital expenditures dedicated to the planning of design of a new system" which could take several months and possibly years (RR-DTE-62). Verizon indicates further that it would need to collect a sufficiently large sample of calls and switches to capture a valid statistical sample, and then would need to compile the raw data (id.). Verizon is unable to provide "a realistic estimate of the time and resources that would be required to perform a study to quantify the NCT factor based on recently measured Massachusetts specific data" (id.). Although this factor clearly affects the cost calculation, we observe that no party has contested this component specifically, but rather the dispute focuses on the call completion ratio.

In the absence of more recent, i.e., more accurate, support, we reject Verizon's proposed call completion ratio of 71.5 percent because Verizon has failed to provide persuasive argument and supporting data as to why traffic patterns of ten years ago would be relevant for today's TELRIC study, and, as discussed below, because we concur with AT&T and WorldCom that the level is likely significantly higher. However, because call completion ratio data will be available by the third quarter of 2002, we direct Verizon to submit the more up-to-date call completion data and any supporting studies and/or documentation in a compliance filing to be submitted no later than 25 days after the date of this order. If such data are not available by this date for the Department and interested parties to examine, Verizon shall use 80 percent as the call completion ratio for the reasons discussed below.

We realize that AT&T and WorldCom lack empirical analysis for the specific number that they propose, but find that AT&T and WorldCom have provided persuasive arguments as to why the number should be higher than that proposed by Verizon. Furthermore, as Verizon has unique access to the information that would provide the most up-to-date data, we cannot reasonably fault the intervenors for failing to substantiate their proposal. The evidence suggests that the lower bound is likely to be 71.5 percent because we find that, on balance, the increase in calls completed as a result of the widespread deployment of answering machines, voice mail, and call waiting is likely far greater than any decrease in calls completed resulting from the deployment of call blocking and caller identification. Answering machines and voice mail clearly and unambiguously serve to increase calls completed. Whether those who call customers, who choose not to answer after examining the callers' identification, decide to hang up or complete their call by leaving messages on answering machines is unknown, but it is reasonable to assume that at least some percentage of them choose to leave messages, thus completing their calls. Furthermore, the penetration data for optional features provided in Exh. ATT-VZ 22-3-P shows that caller identification and call blocking are far from being ubiquitously deployed. These data also demonstrate the popularity of call waiting, a feature that likely increases the percentage of calls completed. For the foregoing reasons, we find that Verizon's proposed call completion ratio of 71.5 percent is too low. AT&T and WorldCom propose a call completion ratio of 85 percent. Based on the record, as discussed above, we direct Verizon to use a call completion ratio of 80 percent (Exh. ATT-VZ 4-49-S; Exh. ATT-21, at 10).

AT&T raises the separate concern that D.T.E. Tariff No. 17, Part B, Section 6.3 increases recorded originating measured minutes by a NCT and call attempt additives. Specifically, AT&T recommends that Verizon be ordered to remove these additives so that

Verizon does not recover non-conversation costs twice, once through the UNE cost study, and then again in the tariff (AT&T Reply Brief at 75-76). Verizon asserts that it will prevent such double-counting at the time of its tariff filing (id. at 86 n.87). Accordingly, Verizon must demonstrate in its compliance filing that when it translates the UNE costs into UNE rates, that it is not double-recovering for NCT and call attempts.

8. Busy Hour to Annual Conversion Factor

The busy hour to annual conversion factor directly affects the MOU cost (Exh. VZ-37, Part C-2, Workpaper at 1, line 27, at 2, line 28). Two disputed issues affect Verizon's derivation of this factor. One issue is the determination of the quantity of days to use in the calculation. The other issue concerns the BH/AHD factor. Verizon observes that the FCC's Modified Synthesis Model uses 270 days and a BH/AHD ratio of 0.10, which, when combined, yields a conversion factor of 0.00037, a figure higher than Verizon's proposed factor of 0.00031, and thus which, if adopted, would yield higher MOU costs than Verizon's proposed factor does. The Department is not persuaded, however, that the underlying rationales for these two factors are linked, and rather finds that we should address the merits of the two issues separately. The determination of the appropriate number of days is a separate matter from the determination of the BH/AHD factor.

On the first issue, Verizon proposes 251 days (Exh. VZ-37, Part C-3, section 7); the HAI input is 270 days (Exh. ATT-25); AT&T and WorldCom recommend 365 days, or in the alternative, 308 days (WorldCom Brief at 35); and Z-Tel recommends 308 days (Z-Tel Reply Brief at 6). We are persuaded by Verizon's contention that traffic is not identical on all days, so use of a 365-day division would overstate the number of minutes over which Verizon could recover switching-related costs and thus would be inappropriate. However, we are not persuaded that 251 days is appropriate. Traffic patterns have likely evolved since 1997. Therefore, it is reasonable to assume that the weekend days and holidays, which Verizon excluded, should be counted each as a half-business day, yielding 251 days plus 0.5 times 114 days or 308 days. Accordingly, Verizon should use 308 days as a basis for computing MOU costs.

We turn next to the issue of the BH/AHD, a factor that indicates the distribution of traffic throughout a day. Theoretically, the lowest possible factor is 0.042 (that is one hour divided by 24 hours), which would assume that traffic is distributed perfectly evenly throughout a 24-hour day (Tr. 12, at 2340-2341). Based on a 1997 study, Verizon proposes a factor of 0.083 (Exh. ATT-VZ 4-48-S). The HAI input is 0.10 (Exh. ATT-25). AT&T recommends that the Department adopt 0.07 (AT&T Brief at 97-98), and WorldCom proposes 0.073 (WorldCom Brief at 34).

The basis of Verizon's proposed 0.083 BH/AHD ratio is a Verizon study conducted in New York in 1997 (Exh. ATT-VZ 4-48-S). It is reasonable to expect increasing use of the Internet to spread traffic more evenly throughout the day, thus causing this factor to decline (Exh. ATT-21, at 7-8). It is unlikely that today's use of the public network is the same as it was five years ago when Verizon last studied this aspect of the traffic that it switches. WorldCom's arguments that Internet use continued to grow since 1997, when Verizon's study was completed, and that growth in dial-up access is consistent with growth in DSL and cable modem access are persuasive. However, the record includes no empirical analysis, and, thus, there is no specific support for the approximate one percentage point adjustment recommended by WorldCom and AT&T. Clearly a factor of 0.042, which would suggest that traffic is evenly distributed throughout the day, would not be credible. Therefore, a reasonable number is bounded below by 0.042 and, based on changing traffic patterns, is bounded above by the 0.083 that Verizon measured five years ago.

Verizon did not provide any recent study to substantiate its proposed BH/AHD factor and implied that to conduct such a study would be time-consuming and difficult. During the hearings, the Department asked Verizon's witness about the feasibility of studying the BH/AHD ratio based on today's traffic patterns. Ms. Matt described the process as requiring a "tremendous effort" entailing a "tremendous database," and she also observed that the "NCAT" system that Verizon used for the 1997 study is no longer available (Tr. 12, at 2338-2339).

The Department afforded Verizon several opportunities to bolster its support, once by granting AT&T's request that the Department direct Verizon to supplement its original data response and then later during the course of the hearings the Department questioned Verizon further about the support for its proposed factor (<u>October 18 Interlocutory Order</u>; ATT-VZ 4-48; ATT-VZ 4-48-S; Tr. 12, at 2338-2341).

Verizon used a factor of ten percent in the 1995 cost study that was investigated in Phase 4 of the <u>Consolidated Arbitrations</u> (RR-DTE-61). In this proceeding, Verizon bases its proposed factor of 8.3 percent on a study completed five years ago. Based on the evidence in this case, the Department cannot reasonably conclude that a five-year-old study provides evidence of the accuracy of Verizon's proposed BH/AHD factor (RR-DTE-61; Exh. ATT-VZ 4-48-S; Tr. 12, at 2335). We are not persuaded, however, that a simple "trending" analysis can be used to determine an appropriate level for today.[127] Accordingly, we direct Verizon to modify the BH/AHD factor from 8.3 percent to 7.0 percent so that the cost study will be appropriately forward-looking. This change to Verizon's cost study changes the conversion factor from 0.000331 to 0.000279 and lowers the MOU cost by approximately 15 percent (Exh. VZ-37, Part C-2, Workpaper at 1, Part C-3, Section 7, Workpaper).

9. HAI 5.2a-MA Model

AT&T's proposed HAI 5.2a-MA model is based on switch cost data from 1983 to 1995, updated to 1999 levels (Exh. ATT-25, Mercer Direct, exh. RAM-3 (HAI 5.2a-MA Inputs Portfolio); Inputs Order at ¶ 296, App. C). The Department concurs with AT&T that Verizon's switch cost data are more current and applicable to UNE costs in Massachusetts than the outdated cost information upon which the FCC relied in its Inputs Order. Therefore the switch cost results yielded by the HAI 5.2a-MA are not reliable.

AT&T, however, is silent as to whether it recommends that the Department use the HAI 5.2a-MA model to compute costs with the more up-to-date switch cost information. As AT&T apparently does not propose the use of the HAI 5.2a-MA model as a tool for computing switching costs, the Department need not render a decision as to its applicability in this proceeding.

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[127] If, for example, we assume the same percentage decline every two years as occurred between 1995 and 1997 (that is, the 1997 level is 83 percent of the 1995 level of ten percent), and repeat that pattern (of adjusting the factor by 83 percent every two years), the factor in 2001 would be 0.057, a result that we do not find credible.

Therefore, Verizon shall use its proposed SCIS in its compliance filing and shall submit any and all supporting workpapers associated with Verizon's incorporation of the modifications directed herein both in the SCIS model and in Part C of its Recurring Cost Study.

10. Intra-Switch Calls

The Department has been consistent on the billing methodology that it deems appropriate for intra-switch calls. The Department considered the issue, and determined that switching costs did not differ, whether the call was intra-office or inter-office (Tariff No. 17 Order at 219). Thereafter, it confirmed the determination, by rejecting a motion for reconsideration (Phase I Order at 45-46). Verizon has not presented new evidence in the current proceeding that intra-office and inter-office switching costs are different. Thus Verizon has failed to demonstrate why the Department should alter its previous findings.

C. Issues Related to Switching

1. Right to Use Fees

a. Positions of the Parties

i. Verizon

The right to use fee or factor corresponds to the costs of buying or leasing the software for digital switches (Exh. VZ-36, at 53-54). The software is necessary for initial deployment. The software also enables upgrading for new functionalities or the generic software releases occurring once or twice per year (Exh. VZ-38, at 71-72). In 1999, "[a]ll software RTU fees were capitalized, based on recent changes in accounting rules" (Exh. VZ-36, at 53).

Verizon develops a proposed RTU factor, which is intended to recover fees associated with software costs, and then applies the factor to the MOU investment in order to compute the "right-to-use cost per MOU" (Exh. VZ-36, at 160; Exh.VZ-37, Part C-1, Part C-2, Section 6, Workpaper, and Part G). Verizon includes this cost in the final proposed MOU cost (Exh. VZ-37, Part C-1, Part C-2, Section 1, Workpaper). The development of the RTU factor relies on actual expenditures for 1999 and 2000 and budgeted expenditures for 2001 and 2002 (Exh. VZ-37, Part G-9, Workpaper at 1). The 1999 expenditures are approximately $200 million higher than the 2000 expenditures because Verizon changed its accounting treatment of software expenses in that year (Tr. 8, at 1646-1647).

Verizon contends that "the user that utilizes a large share of resources should be required to pay a larger amount for those resources than a user using less of the resources" and raises the concern that assigning RTU costs to fixed monthly charges would result in the residential usage customer subsidizing the higher usage business customer (Verizon Brief at 156; Verizon Reply Brief at 74). Verizon characterizes the software as "entirely use-driven" because the "switch processor does nothing until the end-user invokes software and calls up the programs that are necessary to set up the call and maintain it" (Verizon Reply Brief at 74).

Verizon also defends the inclusion of full 1999 data in the RTU calculations, stating that there "is no reason to ignore a spike in expenditures" (Verizon Brief at 157). Furthermore, Verizon asserts that it is unlikely that if the 1999 RTU expenditures had been significantly lower, rather than higher, than the other years, AT&T would have proposed that the year be excluded (Verizon Reply Brief at 73). Verizon claims that if the costs in question had not been capitalized, they would be spread out over future years (id. at 74).

ii. AT&T

AT&T faults Verizon's estimate of the level of RTU fees and Verizon's allocation of these fees to switch usage (AT&T Brief at 89-90). AT&T argues that Verizon failed to support its estimates of RTU fees and that Verizon overstates its 1999 RTU cost by almost $200 million (id. at 89). AT&T explains that 1999 was anomalous because a change in the method of accounting occurred in that year (AT&T Brief at 89; AT&T Reply Brief at 72). According to AT&T, the appropriate RTU costs for 1999 are not the $377.5 million proposed by Verizon, but rather $184.6 million, which excludes the impact of the accounting change (AT&T Brief at 89). AT&T asserts that the effect of a change in accounting is a one-time historic cost which TELRIC disallows (id.). AT&T observes that Verizon's witness testified that he did not foresee any significant spikes in its planning horizon, nor do Verizon's engineers anticipate any spikes in annual software investment (AT&T Reply Brief at 72, citing Tr. 12, at 2437).

AT&T also disputes the proposed allocation of the RTU fees to the MOU rate for switch usage (AT&T Brief at 90). AT&T states that RTU fees correspond with licensing fees paid for software on the switch, which are independent of usage on the switch (id.). AT&T asserts that the costs "should not be assigned to the most volatile usage-sensitive element" (id.). AT&T states that because Verizon will not exhaust its RTU fees, it would be incorrect to require one user of a switch to pay more toward RTU fees than another user, and elaborates that allocated fixed costs to traffic-sensitive rates will permit Verizon to over-recover its costs (id.).

iii. WorldCom

WorldCom argues that Verizon misallocates switch investment costs, explaining that because digital switches are port-limited and not MOU capacity-constrained, new expenditures will be necessary because port capacity has been reached and not because of switch exhaust (WorldCom Brief at 28-30). WorldCom observes that Verizon wants to omit the RTU fees in determining reciprocal compensation rates and quotes from Verizon testimony that RTU fees "[have] no relevance to minutes of use" (id. at 31). Thus, according to WorldCom, Verizon has contradicted itself, implicitly and explicitly (id. at 31-32).

WorldCom recommends that the Department assign the full RTU costs to the monthly port rate (id. at 32). In addition, WorldCom proposes that, in calculating the RTU costs, Verizon use actual expenditures for 1999, i.e., that Verizon exclude the spike in costs related to the accounting changes, and so decrease the RTU factor by about 26 percent (id. at 67-68).

b. Analysis and Findings

The determination of the appropriate RTU factor requires us to examine three distinct issues. First, the Department will address the reasonableness of Verizon's proposed inclusion of a one-time spike in costs in a forward-looking cost study. Then, we will consider the intervenors' recommendation that the RTU costs be assigned to non-traffic-sensitive UNEs rather than to MOUs. Finally, the implications of our directives on switch material prices for Verizon's RTU costs were addressed in Section VII.B.2.

Regarding the first issue, there is no evidence to suggest that the 1999 spike in RTU costs, associated with a one-time change in accounting treatment, will recur. We are not persuaded by Verizon's argument that vendor software that is developed in the future "may easily cause another spike" (Verizon Brief at 157). The record demonstrates that the substantial spike in expense that occurred in 1999 was unrelated to vendor software and thus there is no evidence of such extraordinary volatility in software expense (Exh. ATT-VZ 12-2-P). Furthermore, Verizon expects "that the annual amount of RTU will settle at the estimated amount reflected in the Company's studies" (Exh. VZ-38, at 72-73). Therefore, it would be inappropriate to include the component of the 1999 cost that is unique to that year's accounting change in a forward-looking cost study. Instead of the proposed $377,484,055 for 1999, Verizon shall use the more representative figure of $184,600,00, which excludes the effect of the SOP98-1 implementation (Exh. VZ-37, Part G-9, Workpaper at 1; Exh. ATT-VZ 12-2-2S). For 2001, Verizon's cost study increased its original estimate by $30 million "to be more in line with prior actuals" (Exh. ATT-VZ 12-2-2S, footnote). Information on actual expenditures is now available (RR-DTE-67-P). In addition to eliminating the cost of the one-time accounting change, Verizon shall use the more recent 2001 RTU data in its compliance filing.

We turn now to the second issue of cost assignment. Verizon expresses the concern that if RTU costs are assigned to ports rather than to MOUs, residential customers will subsidize higher usage business customers. Our objective in this proceeding is to establish costs that can be translated readily into prices that provide, to the greatest degree feasible, accurate signals about UNE costs, and thus Verizon's argument is persuasive only if we are mis-assigning costs.

A decline in switching prices could stimulate demand and although we cannot predict the magnitude of such an increase, the volatility of demand underscores the importance of assigning fixed costs correctly. During the five years that the UNE costs that we establish in this proceeding are in effect, traffic volumes could be either significantly less or more than Verizon now anticipates. If traffic volumes exceed Verizon's forecast, and if fixed costs are assigned to traffic-sensitive MOUs, then Verizon will over-recover these costs. Similarly, if traffic volumes are less than Verizon's forecast, and if fixed costs are assigned to traffic-sensitive MOUs, then Verizon will under-recover these costs. On the other hand, by assigning fixed costs to fixed rate elements, such volatility in traffic demand will not affect Verizon's recovery of these costs. Accordingly, Verizon shall assign RTU costs to non-traffic-sensitive UNEs.

2. Reciprocal Compensation

a. Positions of the Parties

i. Verizon

Reciprocal compensation charges apply when CLECs and Verizon terminate local calls that originate on the other carrier's network. Depending on the relative volumes of traffic, either Verizon or a CLEC can be the net payor of reciprocal compensation. Verizon proposes reciprocal compensation costs that are lower than the terminating costs that Verizon would charge CLECs for UNE traffic (RR-DTE-48). The reason for the difference is that Verizon proposes to recover "getting started" costs and RTU costs from MOU terminating usage but proposes to exclude these costs from reciprocal compensation (Exh. VZ-37, Part C-3, Section 1, Workpaper, Section 4, Workpaper). Verizon explains that it excludes these costs because "the switch is already functioning, there is no need to incur additional 'getting started' costs or RTU cost" (Verizon Brief at 164). In support of its proposal, Verizon relies on the Telecom

Act, which states, among other things, that the costs of reciprocal compensation should be based on the "additional costs" of terminating such calls (Verizon Reply Brief at 81; Verizon Brief at 163-164, citing Telecom Act, Section 252d(2)(A), Exh. VZ-38, at 77-78).

ii. AT&T

Verizon understates the costs of reciprocal compensation, according to AT&T, because it is "a net payor of reciprocal compensation charges in Massachusetts" (AT&T Brief at 106). AT&T contends that Verizon is seeking to maximize its UNE revenues and to minimize its reciprocal compensation payments (id. at 107). Furthermore, AT&T observes that Verizon acknowledges that the switch treats reciprocal compensation traffic and UNE traffic the same (id.). In further support of its position, AT&T states that the FCC "has expressly ruled that the reciprocal compensation rate for terminating traffic shall be equal to the TELRIC rate for unbundled switching (unless reciprocal compensation is subject to a bill-and-keep mechanism)" (id., citing Local Competition Order at ¶ 1054; 47 C.F.R. § 51.705(a)(1)). AT&T states that Verizon's interpretation of the Act should not "replace clear FCC rulings on how this language should be interpreted" (AT&T Reply Brief at 77).

AT&T presents the Department with two remedies. If the "getting started" costs and RTU fees are assigned to the non-traffic-sensitive port charge, which AT&T contends would be consistent with the FCC's directives, then the reciprocal compensation and UNE costs would be the same (AT&T Brief at 108, citing Local Competition Order at ¶ 1057). If, contrary to AT&T's recommendation, the Department approves Verizon's proposal to allocate "getting started" and RTU costs to the traffic-sensitive UNEs, then AT&T recommends that they also be assigned to reciprocal compensation (id.). In summary, AT&T proposes that, in any event, "the final rates for reciprocal compensation termination should be set equal to the final rates for unbundled switching termination, as required by the FCC" (id.).

iii. WorldCom

WorldCom recommends that Verizon's reciprocal compensation rate be identical to its unbundled switching rate because the switch processing of the traffic is indistinguishable and because consistent rate treatment comports with WorldCom's interpretation of the FCC's findings in the Local Competition Order on the assignment of non-traffic-sensitive costs (WorldCom Brief at 31-33). WorldCom quotes from the Local Competition Order that "only that portion of the forward looking economic costs of end office switching that is recovered on a usage-sensitive basis constitutes an 'additional cost' to be recovered through termination charges" and that "non-traffic sensitive costs should not be considered 'additional costs' when a LEC terminates a call that originated on the network of another carrier" (id. at 31, citing Local Competition Order at ¶ 1057). Thus WorldCom links the analysis of reciprocal compensation to the analysis of "getting started" and RTU fees, and specifically recommends that the Department make both terminating and reciprocal compensation rates consistent with the changes proposed by Ms. Pitts (id. at 33).

iv. CLEC Coalition

Verizon's proposal for reciprocal compensation, according to the CLEC Coalition, is a "have your cake and eat it too" proposal that "flies in the face of the FCC's TELRIC pricing rules and principles" (CLEC Coalition Brief at 87). Characterizing Verizon's proposal as "opportunistic," the CLEC Coalition states that the FCC's rules explicitly require that reciprocal compensation cost studies be based on the same TELRIC methodology as UNE cost studies (id. at 88, citing 47 C.F.R. § 51.705(a)(1)). The CLEC Coalition observes that Verizon concedes that technically, the switch treats UNE and reciprocal compensation calls identically (id. at 91, citing Tr. 7, at 1326, Exh. ATT-VZ 12-10).

The CLEC Coalition quotes extensively from the FCC's Local Competition Order and from the FCC's Rules in support of its position (id. at 88-90). The CLEC Coalition urges the Department to reject Verizon's proposal, which, as the CLEC Coalition describes it, would lower the reciprocal compensation rates that Verizon pays to CLECs while keeping high rates for CLECs when CLECs purchase Verizon's unbundled local switching (id. at 91).

b. Analysis and Findings

Parties dispute Verizon's proposal to set costs for reciprocal compensation that differ from those for terminating switched usage. The relationship of reciprocal compensation charges to terminating UNE costs is related to the treatment of "getting started" and RTU costs: the reason for the difference in the proposed costs is that Verizon proposes to recover "getting started" costs and RTU costs from MOU terminating usage but proposes to exclude these costs from reciprocal compensation (Exh. VZ-37, Part C-3, Section 1, Section 4, Workpaper).

Verizon acknowledges that on "a strictly technical basis, the switch does not treat either type of terminating call differently" but rather that Verizon "has allocated the costs differently" (Exh. ATT-VZ 12-10). Verizon relies on its interpretation of the Telecom Act in support of its proposal, but failed to rely on the FCC's guidance on this matter. In its Local Competition Order, the FCC determined that reciprocal compensation cost studies should use the same cost methodologies as UNE cost studies, and specifically concluded that "the pricing standards established by section 252(d)(1) for interconnection and unbundled elements, and by section 252(d)(2) for transport and termination of traffic, are sufficiently similar to permit the use of the same general methodologies for establishing rates under both statutory provisions." Local Competition Order at ¶ 1054.

Contrary to Verizon's assertion that "the additional cost standard tells us to look at an increment bounded on the upper end by all traffic and on the lower end by all traffic, less reciprocal compensation traffic" (Exh. VZ-18, at 82) and consistent with the FCC's directives, we find that the additional costs associated with reciprocal compensation are no different from the additional costs associated with UNE switching terminating usage, given, as Verizon concedes, that the switch does not treat either type of terminating call differently. Therefore, apart from our findings on the proper assignment of "getting started" and RTU costs, we find that Verizon's costs for reciprocal compensation and terminating usage should be identical. The level of these costs will be determined, in part, by our findings that "getting started" costs and RTU fees should be assigned to non-traffic-sensitive UNEs.

VIII. INTEROFFICE FACILITIES

A. Introduction

Interoffice facilities transmission network elements include dedicated transport, shared (common) transport, and dark fiber. Dedicated transport is defined as ILEC transmission facilities dedicated to a particular customer or carrier (e.g., T1, DS3, OC3, OC12).[128]

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[128] T1, which stands for Trunk Level 1, is a digital transmission link with a total signaling speed of 1.544 million bits per second ("Mbps"). DS3, which stands for Digital Signal, level 3, operates at a signaling rate of 44.736 Mbps, equivalent to 28 T1s. OC3, which stands for Optical Carrier, level 3, is equal to three DS3s or 155.52 Mbps. OC12, which stands for Optical Carrier, level 12, is equal to 622.08 Mbps.

Common transport is defined as transmission facilities shared by more than one carrier, including the ILEC. Dark fiber, which also can be leased as a UNE loop or a UNE IOF, is discussed in more detail in Section VI.E, above.

Verizon develops monthly costs for its dedicated transport IOF investments on a fixed and variable (per mile) basis (Exh. VZ-37, Part D). The fixed investments are associated with the originating and terminating wire centers and include electronic equipment such as Synchronous Optical Network ("SONET")[129] add/drop multiplexers, digital cross-connect systems ("DCS"), and fiber terminations. The variable investments vary with the length of the facility and include interoffice fiber cables, structure, and electronics at intermediate wire centers (Exh. VZ-36, at 169-170).

Verizon proposes a 75 percent utilization factor to account for rapid IOF growth, churn, equipment breakage, and administrative spare (id. at 171). Verizon applies this factor at each multiplexing level in its proposed IOF model (id.). Verizon does not propose to deaverage IOF rates because IOF can originate and terminate in different density zones.

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129 SONET is

> [a] family of fiber optic transmission rates from 51.84 million bits per second to 39.812 gigabits (thousand million) per second (and going higher, as we speak), created to provide the flexibility needed to transport many digital signals with different capacities, and to provide a design standard for manufacturers. SONET is an optical interface standard that allows interworking of transmission products from multiple vendors . . . . It defines a physical interface, optical line rates[,] . . . frame format and an [Operations, Administration, Maintenance and Provisioning] protocol.

Newton's Telecom Dictionary, 17th ed. at 638.

Verizon's IOF configuration is based on technology using SONET fiber optic transport rings. The material prices for electronic equipment and cables that Verizon uses in its IOF cost study represent the latest negotiated contract prices that Verizon has with equipment and cable manufacturers (id. at 172-173).

Verizon develops its common transport IOF, offered on an MOU basis, by dividing the dedicated transport investments by the capacity of annual MOU that could be transported by those investments (Exh. VZ-37, Part C, Switching). Thus, Verizon's methodology for estimating dedicated transport investment directly affects its proposed common transport IOF costs.

AT&T, WorldCom, and the CLEC Coalition recommend that the Department revise certain assumptions and data in Verizon's dedicated and common transport cost studies (see AT&T Brief at 196). The parties raise six issues concerning Verizon's calculation of IOF costs: (1) the number of nodes assumed per SONET ring[130]; (2) the transmission equipment EF&I factor; (3) the utilization factors; (4) the bundling of DCS with dedicated transport; (5) the weighted average distance between wire centers; and (6) the technology vendor mix. AT&T recommends that the Department use Verizon's IOF cost study, with modifications, to estimate dedicated transport costs (AT&T Brief at 198). Accordingly, we do not address the IOF portion of AT&T's HAI Model.

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[130] SONET transmission systems "ideally are laid out in a physical ring for purposes of redundancy. In practice, the topology often is that of a linear ring, which is linear in its physical appearance, but which operates as a logical ring." Newton's Telecom Dictionary, 17th ed. at 639.

B. Number of Nodes per SONET Ring Assumption

1. Overview

A node is typically located at a wire center and represents a point at which transport circuits may enter and exit a SONET ring (Verizon Brief at 114). Verizon's current network architecture in Massachusetts has an average of 3.83 nodes per SONET ring (id. at 115). In its IOF cost study, Verizon assumes 3.83 nodes per SONET ring to compute the variable IOF cost and six nodes per SONET ring to estimate the fixed IOF cost (id.). Verizon claims that this approach is "entirely appropriate and consistent with Verizon's past practices in other proceedings involving forward-looking cost estimation" (id.). Other parties challenge the apparent inconsistency between Verizon's assumption of 3.83 nodes per ring in its calculation of the distance-sensitive IOF costs and its assumption of six nodes per ring it its calculation of fixed IOF costs. CLECs also contend that Verizon's proposed use of six nodes to compute fixed IOF costs is economically inefficient and unsupported. AT&T, WorldCom, and the CLEC Coalition recommend that Verizon assume 3.83 nodes per ring to compute both the fixed and the variable IOF costs.

2. Positions of the Parties

a. Verizon

Verizon asserts that its use of the actual number of nodes per SONET ring (i.e., 3.83) is appropriate for computing the mileage-sensitive component of IOF UNE costs (Verizon Brief at 118). Verizon bases this determination on its "conservative assumption that, in a forward-looking network, the actual length of Verizon-MA's SONET rings would not change –

or change much – even as additional nodes were added" (id.). Verizon explains that, in its calculation of the mileage-sensitive component of IOF UNE costs:

> Because Verizon MA only maintains data on the average distance between nodes on its SONET rings (but not the average total ring length), Verizon MA calculated the average total ring length by multiplying the average distance between nodes by the average number of nodes on deployed rings in the existing network (id.) (emphasis in original).

According to Verizon, for the purpose of computing the fixed component cost, it assumes more nodes than currently exist in its network so as to reduce ring interconnection requirements and reduce overall transport costs (id. at 116). Verizon states that "[i]n addition, larger rings (i.e., those with a greater number of nodes) reduce the network's sensitivity to demand uncertainty, thus reducing the need for spare capacity and capacity 'chasing' across multiple rings to make connections, and thereby increasing the economic efficiency of the network" (id.). Verizon further states that the actual number of nodes in its current network has been limited by practical constraints, while its forward-looking assumption of six nodes per ring is now achievable due to "enhanced capabilities of the latest generation of SONET technology and operations" (id. at 117-118). Verizon consequently does not include the "embedded average" (i.e., 3.83) which "includes a very large number of point-to-points, which reduce the average greatly" (id. at 117). Verizon asserts that its "engineering experts determined that a six-node design was the appropriate model to best estimate the cost of the forward-looking SONET architecture for its transport studies" (Verizon Reply Brief at 135).

In response to the CLECs' opposition to the assumption of six nodes per ring, Verizon contends that the "six-node model is the best estimate of the cost of an efficiently designed inter-office network" and also asserts that one cannot change the number of nodes in the fixed component of an IOF model without changing other parameters (id. at 136). Verizon also claims that using two different figures for the number of nodes per SONET ring assumption is not inconsistent because the unique components of costs are estimated independent of each other (Verizon Brief at 118-119).

b. AT&T/WorldCom[131]

AT&T claims that Verizon's forward-looking assumption of six nodes per SONET ring for the fixed component of IOF UNE rates is incorrect and Verizon should instead use its actual average of 3.83 nodes per SONET ring (AT&T Brief at 199). AT&T argues that the fixed cost element of IOF increases as the number of nodes per SONET ring increases (id. at 200). According to AT&T, "[t]he result of assuming six nodes per ring is higher costs and less efficient use of the electronics equipment placed on the ring, which is the most expensive part of SONET ring architecture" (id. at 201).

AT&T further claims that Verizon offers no analysis to support its six-node-per-SONET-ring assumption (id. at 200-201). AT&T concludes that without supporting evidence and because the number of rings in Verizon's regional network is consistently near 3.83, Verizon's assumption of six nodes per ring was "made to produce a cost estimate that satisfied Verizon's cost group" (id. at 202). AT&T contends that Verizon's only support for its use of six nodes is that Verizon used the same assumption in other proceedings (AT&T Reply Brief at 128). In response to Verizon's assertion that larger rings with more nodes result in efficiencies such as less fiber and fewer ring interconnections, AT&T asserts that more nodes also decrease efficiencies because they decrease equipment utilization at the nodes (id. at 128-129). AT&T

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[131] WorldCom supports AT&T's position (see WorldCom Brief at 59-60).

also counters Verizon's claim that its assumption of six nodes is efficient by asserting that Verizon's assumption is inconsistent with the trend in SONET engineering and with Verizon's own engineering documents (id. at 129, citing Exh. ATT-VZ 27-2).

c. CLEC Coalition

The CLEC Coalition states that, "[b]y significantly understating the number of ports that must be utilized at each SONET node to provide 48 DS3s on the SONET ring, Verizon has significantly overstated its investment per DS3, thereby substantially inflating the claimed dedicated interoffice transport costs" (CLEC Coalition Brief at 78). While the CLEC Coalition agrees with Verizon that 96 ports are necessary to support 48 DS3s on a SONET ring, it argues that Verizon should use its actual 3.83 nodes per SONET ring figure to calculate the fixed component of IOF UNE rates (id.). As a result, the CLEC Coalition claims that each node should average approximately 25 ports (i.e., 96 total ports ÷ 3.83 nodes per SONET ring = 25.07 ports per node) instead of 16 ports (i.e., 96 total ports ÷ 6 nodes per SONET ring = 16 ports per node) as Verizon assumes for its dedicated IOF study (id.).

The CLEC Coalition provides three reasons that 3.83 nodes per SONET ring is a more appropriate figure than six nodes per SONET ring in calculating the fixed component of IOF UNE rates (id. at 80). First, the CLEC Coalition claims that the 3.83 node average yields lower rates (id.). Second, the CLEC Coalition proposes that Verizon's six-node assumption "should be rejected because it is inconsistent with anything observed in Verizon's existing network" (id.). Third, according to the CLEC Coalition, the record lacks sufficient evidence to support the credibility of Verizon's assumption of six nodes per SONET ring (id.).

The CLEC Coalition explains that Verizon's DS3 dedicated transport study serves as the basis for Verizon's DS1 and DS0 dedicated transport cost studies (id. at 79). The impact, according to the CLEC Coalition, is that the alleged error in Verizon's DS3 dedicated transport cost study improperly inflates DS1 and DS0 dedicated transport costs as well (id.). According to the CLEC Coalition, the Department should order Verizon to base its cost model on an average of 25 ports per node, rather than 16, because Verizon, bearing the burden of proof, fails to support its proposed forward-looking assumption (id. at 81).

3. Analysis and Findings

Verizon uses the figure of 3.83 nodes per ring to estimate ring length in its calculation of the mileage-sensitive component of IOF UNE costs because "Verizon MA does not maintain data concerning the average total of existing rings" and it was thus "necessary to determine the average length of a ring using other data" (Exh. VZ-38, at 88). In this context, Verizon's use of its existing network characteristics to determine distances is reasonable. Furthermore, none of the parties challenge this calculation. Accordingly, the Department approves Verizon's use of the 3.83 nodes per SONET ring figure to estimate ring length in its calculation of the mileage-sensitive component of IOF UNE rates.

Parties, however, challenge Verizon's proposed assumption of six nodes per SONET ring to compute the fixed component of IOF costs. Each SONET ring provides 48 DS3 connections, which in turn requires 96 ports (each DS3 enters the ring at one node and departs at another) (Exh. ATT-16, at 5). Based on Verizon's assumption, its model requires 16 ports per node (96 ÷ 6). Using 3.83 nodes, as CLECs propose, would yield approximately 25 ports, and thus potentially result in lower costs, depending on the impact of this assumption on other network characteristics (e.g., spare capacity and ring interconnections).

The number of nodes that Verizon proposes per SONET ring for the purpose of computing fixed costs is seemingly inconsistent with our approval of 3.83 nodes per SONET ring to calculate the mileage-sensitive component of IOF UNE costs. But, Verizon's reason for using 3.83 nodes in the context of the mileage component of IOF was solely to estimate ring length and thus, because the number was used specifically for this limited purpose, it need not be identical to the number of nodes assumed per SONET ring for modeling fixed IOF costs (Verizon Brief at 118-119). Therefore, the apparent inconsistency does not, per se, persuade us that Verizon's proposed use of six nodes for computing fixed investment is inappropriate.

Nevertheless, intervenors raise legitimate questions about whether the use of six nodes per ring corresponds with a least-cost forward-looking network. Elsewhere, we have found that existing practices are not necessarily indicative of forward-looking practices, and thus, the mere fact that Verizon presently deploys 3.83 nodes per ring does not persuade us that this existing network characteristic should necessarily be used to model forward-looking costs. However, departing from present practice when such departure appears to increase costs merits closer scrutiny. As we explain below, the record includes evidence suggesting that the use of six rather than approximately four nodes per ring will both enhance and decrease network efficiency. The use of six rather than approximately four nodes per ring may enhance the network efficiency because it would increase the probability that Verizon could create a DS3 circuit between two offices without having to use more than one ring. Also, by reducing the network's sensitivity to demand uncertainty, the use of six nodes could reduce the need for spare capacity (Exh. VZ-38, at 84-87). Furthermore, if Verizon assumes four nodes per ring rather than the six nodes it models in its proposed IOF cost study, it might need to increase the ring interconnection factor because of the decreased probability of being able to interconnect on a local ring (id. at 88).

On the other hand, the record also indicates that "[g]iven the growth in data traffic that is occurring and related growth in transport necessary to support this traffic, the forward-looking impact on SONET network engineering is to realize smaller numbers of nodes per ring – not larger number[s] of nodes per ring" (Exh. ATT-16, at 10) (emphasis in original). Furthermore, increasing the number of nodes per ring can decrease efficiency because it will decrease equipment utilization at the nodes. The use of six nodes rather than approximately four nodes increases investment per DS3, which raises IOF costs (id. at 6).

Although the use of approximately four nodes rather than the six nodes that Verizon proposes might increase the need for ring interconnection, and might affect other network attributes, Verizon has not provided any study that quantifies these effects. Verizon has not provided data that support its assertion that, on balance, the gains in efficiencies associated with six nodes offset the inefficiencies associated with this assumption. Although Verizon's proposed use of six nodes is based on the judgment of its cost witnesses, these witnesses did not quantify the net cost efficiencies resulting from their proposed departure from the present network configuration (Tr. 12, at 2465-2467). Furthermore, Verizon's assumption does not appear to be based on engineering guidelines. The following excerpt from the hearings indicates that Verizon did not consult its engineers in its decision to model six nodes:

Q. So my question to you is whether, if we went to your engineers and asked them is the network of the future going to have nodes per ring that on average equal six, that's not what they told you, is it?
A. [GANSERT] I'm not sure what they'd say. The six nodes was not meant to represent that. It was meant to represent a model that would in our judgment capture the average cost of a ring.
Q. It's a costing construct, then.
A. [GANSERT] Exactly. (Tr. 12, at 2471).

Additionally, Verizon indicates that "there are no current guidelines that Verizon MA uses in planning its interoffice fiber ring network" (Exh. ATT-VZ 27-2(g)-S). Based on this representation, we infer that Verizon's SONET engineering guidelines are in flux. Departure from existing network assumptions is entirely appropriate where such departure leads to more efficient results. However, in this instance, Verizon has failed to demonstrate that the assumption of six nodes represents the most efficient forward-looking network assumption. Accordingly, Verizon shall use 3.83 nodes in its compliance filing for computing both fixed and distance-sensitive IOF costs and shall provide workpapers that document clearly how it implements this directive.

C. Transmission Equipment In-Place Factor

1. Overview

The transmission equipment in-place (EF&I) factor[132] is intended to "gross up" the investment to bring it to a level that represents the total installed cost of telecommunications equipment. Verizon proposes a transmission equipment EF&I factor of 53.2 percent, based on its actual experience in 1998 (Exh. VZ-38, at 92). AT&T/WorldCom and the CLEC Coalition

[132] See Section VI.B.6 and n.79 above for discussion of the EF&I factor.

assert that Verizon's proposed EF&I factor is too high and instead propose an EF&I factor of 36.4 percent, based on the EF&I factor that Verizon proposed in New York.

2. Positions of the Parties

a. Verizon

Verizon proposes a 53.2 percent EF&I factor for transmission equipment (Verizon Brief at 121). Verizon's derives its proposed EF&I factor from its "actual experience in 1998, using data reflecting 10,000 material purchases over the Verizon East footprint, the discounted material prices at that time, and the installed equipment for its own network in Massachusetts" (id.) (emphasis in original). Verizon emphasizes that although it utilized a 36.4 percent EF&I factor in the New York UNE proceeding, the lower EF&I factor accounted for "the specific mix of equipment installed in New York in that particular year, which is quite different from the equipment placed in Massachusetts in 1998" (id.).

Responding to the CLECs' proposed use of New York specific data from 1997, Verizon contends that as equipment prices decrease, the EF&I factor generally increases because, according to Verizon, installation costs do not decline when equipment prices decline (Verizon Reply Brief at 141). Verizon contends that the CLECs' proposal is inappropriate because it is based on data from a different state and from a less recent year (id. at 142).

b. AT&T/WorldCom and CLEC Coalition[133]

AT&T claims that Verizon's EF&I factor for transmission equipment is overstated (AT&T Brief at 203). AT&T instead proposes that the Department adopt an EF&I factor for

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[133] WorldCom and the CLEC Coalition support AT&T's position (see WorldCom Brief at 62-63; CLEC Coalition Brief at 82-82).

transmission equipment in Massachusetts equal to the 36.4 percent used in the New York UNE proceeding (id. at 204-205). AT&T asserts that EF&I factors are typically in the 30 percent range and "[t]here is no reason to believe that the installation costs in Massachusetts should be 46 percent greater then the 36.4 percent factor used in New York" (id. at 204). AT&T disagrees with Verizon's assertion that the discrepancy between the New York and Massachusetts EF&I factors is a matter of equipment installed in different years (id.). According to AT&T, "Verizon would need a reduction in price of approximately 11 percent across all of its transmission equipment, combined with proof that its EF&I factors have not changed, in order for the fully installed costs of such equipment to remain the same" (id.). AT&T proposes that the Department adopt an EF&I factor of 36.4 percent in Massachusetts (id. at 205).

AT&T argues further that Verizon indicates that the EF&I factor components (e.g., contract prices, labor rates, IOF transmission equipment) are the same in New York as they are in Massachusetts, and that therefore Verizon's representation that the EF&I factor for Massachusetts should be 46 percent higher than the New York "makes no sense" (AT&T Reply Brief at 133). AT&T also states that, contrary to Verizon's concern that AT&T is relying on data that are almost ten years old, AT&T relies on data from 1997 (id. at 132-133).

3. Analysis and Findings

Verizon proposes an EF&I factor of 53.2 percent, which it derives from its actual experience in 1998, using data reflecting over 10,000 material purchases over the Verizon-East footprint (Exh. VZ-37, Part G-3, Workpaper 7; Tr. 13, at 2517-2519). Verizon uses the entire regional footprint because "depending on the type of equipment installed that year, you'll get different relationships, and that's why we use a large average" (Tr. 13, at 2522).[134] 1998 data that include installations made in, among other states, Massachusetts, as opposed to the 1997 New York-specific factor that the CLECs propose, is more appropriate for use in developing Massachusetts-specific UNE rates. Accordingly we approve Verizon's proposed EF&I factor.

D. IOF Utilization Factors

1. Overview

Verizon's IOF model includes utilization factors, all of which Verizon proposes as 75 percent except for a proposed 80 percent utilization factor for fiber and a 50 percent utilization factor for "OC48 Capacity, DWDM [dense wavelength division multiplexing]" (Exh. VZ-37, Part D-6, Section 5.1, Excel spreadsheet "Parameters," at 1, rows 38-50, column D). Verizon contends that its proposed utilization factors account for facility growth, churn, equipment breakage, and administration spare (Verizon Brief at 112). Verizon then applies this factor at each multiplexing level in the IOF model (id.). Verizon asserts that multiplexing equipment cannot be operated at 100 percent and therefore a reasonable utilization level must be estimated (id.).

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[134] Verizon explains that it relies on "actual installed equipment for its own network in Massachusetts" (Verizon Brief at 121, citing Exh. VZ-38-A, at 92; Tr. 13, at 2519; see also Verizon Reply Brief at 141) (emphasis in original). However, these cited references and Exh. VZ-37, Part G-3, Workpaper 7 imply that, in computing its proposed EF&I factor, Verizon used installed equipment not only for Massachusetts but also for the other 12 states in the former Bell Atlantic footprint. Although one could read Verizon's brief and reply brief to mean that Verizon contends it relies solely on Massachusetts, we assume that Verizon is simply emphasizing that, perhaps in contrast with the development of the New York factor, its proposed factor relies on, among other purchases, those made for Massachusetts.

2. Positions of the Parties

a. Verizon

Verizon proposes a 0.75 utilization factor at each multiplexing level in its IOF model to accommodate rapid IOF growth, churn, equipment breakage, and administrative spare (Verizon Brief at 112; Verizon Reply Brief at 129). Verizon explains that a higher utilization factor, such as the 0.90 proposed by the CLEC Coalition, ignores the realities of network design due in part to the "lumpiness" of IOF multiplexing equipment and that, for example, "a whole DS3 with 28 DS1s is required even if it is serving only 14 working DS1s" (Verizon Reply Brief at 130). Verizon indicated that the impact of these network constraints is a real-world utilization level in the range of 0.65 to 0.70 (Tr. 13, at 2505). Verizon, therefore, considers its proposed IOF utilization factors conservative because it is higher than "the utilization that is, or could be expected to be, achieved in actual practice" (Verizon Reply Brief at 130).

Verizon challenges the CLEC Coalition's proposed utilization rates on the grounds that the rates inappropriately presume a perfectly known, never changing, instantaneous demand level (id. at 131). Verizon claims that such a premise is inconsistent with sound engineering practices and that although such a utilization factor could be attainable for one moment in time, it is not achievable for ongoing operations (id.). Verizon also contends that, contrary to the CLEC Coalition's argument, Verizon's IOF cost model accounts for wholesale and retail demand (id. at 133).

In arguing that AT&T's proposal for a multiplexing utilization factor of 1.00 is unreasonable, Verizon outlines the rationale behind its proposed multiplexing utilization factors. Verizon explains that DS1/DS0 multiplexing is provisioned using D4 channel banks,[135] which are contained in bays of four, five or six banks[136] (id. at 134, citing RR-DTE-69). According to Verizon, it appropriately applies a utilization factor of 1.0 to the individual channel bank investment, but because Verizon does not sell every bank in every bay, it applies a utilization factor of 0.75 to all other channel bank investment (id. at 135, citing RR-DTE-69).

b. AT&T/WorldCom[137]

AT&T proposes a multiplexing utilization factor of 1.00 to replace Verizon's proposed rates (AT&T Brief at 205). AT&T reasons that "[w]hen a CLEC purchases DS0 to DS1 multiplexing, the CLEC is buying the entire capacity of DS1 multiplexing equipment" and further states that "Verizon does not bear any risk if the CLEC does not utilize the whole element." AT&T states that "[f]or this reason, the utilization factor for the DS1 to DS0 multiplexing should be 100 percent" (id.). AT&T further states that the "same is true for DS1 to DS3 multiplexing" (id.).

AT&T asserts that Verizon should have separated multiplexing equipment costs into three categories: (1) bay cost; (2) channel bank common equipment costs; and (3) plug-in cards cost (id. at 206). AT&T concedes that Verizon's proposed fill rate of 0.75 would be

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135 A D channel bank is the interface between the T-1 carrier system and an analog premises device that breaks down a T-1 circuit to its 24 channels. Newton's Telecom Dictionary 17th ed. at 187, 188. D4 is the fourth-generation channel bank. Id.

136 Each channel bank has the capability of multiplexing up to 24 DS0s into one DS1 (RR-DTE-69).

137 WorldCom supports AT&T's position (see WorldCom Brief at 61).

appropriate for the bay equipment under such a scenario, but that it should separately apply a 1.00 fill factor for the channel bank common equipment costs and plug-in cards cost. (id. at 206). Because Verizon did not break the costs down in this way, AT&T proposes that, "since the bay investment represents de minimis portion of the Hardware investment, it is only proper to use the 1.00 fill factor for all of the investment given that Verizon's aggregation of the data does not permit a more accurate analysis of the fill factor" (id. at 207) (emphasis in original).

AT&T contends that Verizon offers no support of its proposed 75 percent fill factor in addition to that originally provided in its direct testimony (AT&T Reply Brief at 133). AT&T further argues that Verizon failed to respond to the Department's request for an explanation of why a 75 percent utilization factor is appropriate for DS1/DS0 multiplexing equipment and this failure is an additional reason justifying the Department's rejection of Verizon's proposed fill factor (id. at 134).

c. CLEC Coalition

The CLEC Coalition claims that Verizon's fill factors should be increased (CLEC Coalition Brief at 74). The CLEC Coalition proposes fill factors for pricing dedicated transport almost universally at 0.90 (CLEC Coalition Brief at 77).[138] The CLEC Coalition contends that Verizon's utilization factors for IOF "should be increased significantly over the proposed 75 utilization rate" (id. at 74). The CLEC Coalition proposes increases to all of Verizon's proposed IOF utilization factors except the proposed 80 percent fiber utilization factor (id. at 77). According to the CLEC Coalition, economies of scale and scope

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138 The two exceptions are "% Utilization ADMs [add/drop multiplexers]" and "% Utilization, Fiber (lit versus unlit)," which the CLEC Coalition proposes to be 0.80.

characterize the hypothetical IOF network because: (1) the network will carry both Verizon's and CLECs' IOF traffic; and (2) Massachusetts, a densely populated, high volume telecommunications market, allows for high rates of utilization (id. at 75-76).

The CLEC Coalition also contends that "TELRIC requires the most efficient utilization of facilities, under which those with the greatest capacity, such as OC-48 rings, should be assumed to carry the base-load and smaller capacity facilities used to accommodate growth" (id. at 76-77). In further support of its proposed increases to the IOF utilization factors, the CLEC Coalition states that SONET facilities (OC-48, OC-12, and OC-3) are modular and thus Verizon can expand them to accommodate growth by adding ports (id. at 75).

The CLEC Coalition further contends that: (1) Verizon fails to assume the sharing of fiber in the feeder with fiber in the IOF network; and (2) Verizon improperly estimates fill factors on the rate of utilization that exists at the time a facility is placed, rather than the increasing demand over time (id. at 76). In support of the second argument, the CLEC Coalition states that "[u]nder TELRIC, a cost study should consider the total demand/output for a network element" (id., citing C.F.R. § 51.505(b)). The CLEC Coalition observes that the NYPSC increased Verizon's proposed fill factors to 85 percent, and, accordingly, proposes a utilization factor of 90 percent for all IOF components except for the ADMs, for which it proposes 80 percent (id. at 77).

3. Analysis and Findings

Intervenors challenge all but one of Verizon's twelve proposed utilization factors for the IOF UNEs. They do not contest Verizon's proposed 80 percent fiber utilization factor.

Verizon's evidentiary support for this factor is persuasive, so the Department approves the 80 percent utilization factor for fiber.

Verizon proposes a utilization factor of 0.75 for IOF components other than fiber and OC48 capacity to account for facility growth, churn, equipment breakage, and administration spare (Exh. VZ-37, Part D-6, Section 5.1, Excel spreadsheet "Parameters"). In addressing the appropriate utilization factors, the Department considers, among things, the amount of the total channel bank common equipment and plug-in equipment for which Verizon bears the risk if the CLEC does not use the entire element. Verizon proposes a utilization factor for both DS1/DS0 multiplexing and DS3/DS1 multiplexing of 75 percent (id.). However, when a CLEC purchases DS1/DS0 multiplexing, the CLEC purchases the entire capacity of the DS1 multiplexing equipment, and thus, if the CLEC chooses to use only three of the 24 channels that are available, the CLEC will nonetheless have paid Verizon for the entire DS1 capacity (Exh. ATT-16, at 14). Thus, analyzed in isolation, the DS1/DS0 multiplexing fill factor should be set to 1.0 because the CLEC, not Verizon, bears the risk of underutilization. By way of explanation of the apparent inconsistency of this outcome and Verizon's proposed utilization factor of 75 percent, Verizon indicates that its DS1/DS0 multiplexing is provisioned using D4 channel banks, which are provisioned in bays containing either four, five or six banks (RR-DTE-69). Verizon states that "[a]lthough a CLEC does 'purchase' the DS0/DS1 channel bank, one must consider the utilization of the number of channel banks per bay, and apply that utilization to the associated equipment that is utilized by all channel banks contained in the bay" (id.). This rationale is not fully persuasive because it appears that the use of a 75 utilization factor nonetheless over-recovers costs from CLECs. AT&T refers to Verizon's cost study in support of its concern that Verizon, contrary to its explanation in its response to RR-DTE-69, does not apply a 1.00 fill factor to some investments. Indeed, the portion of Verizon's IOF cost study that identifies the parameters in its study show utilization factors ranging from 0.50 to 0.80 and do not appear to include any utilization factor of 1.0 (Exh. VZ-37, Part D-6, Section 5.1, Excel spreadsheet "Parameters" at 1, rows 38-50).

AT&T does not dispute that bay costs should have a fill factor less than 1.00 because Verizon needs to provision a full bay even if a CLEC uses less than a full bay (AT&T Brief at 206). However, AT&T indicates that CLECs should only pay for the amount of the channel bank common equipment and plug-in equipment that CLECs require because Verizon does not need to provide more than what the CLECs need (id.). Although AT&T does not cite to the record in support of this assertion, we note that Verizon does not rebut this assertion in its reply brief, other than to state that "unless Verizon were to sell every bank in every bay, which is not the case (see RR-DTE-69), it is appropriate to apply the utilization factor of 75 percent to all other channel bank investment" (AT&T Brief at 206; Verizon Reply Brief at 135). Although Verizon asserts that it applies a 1.00 utilization factor to the individual channel bank investment (Verizon Reply Brief at 135), this is not evident in Verizon's workpapers associated with its IOF cost study and therefore we conclude that AT&T's concern is valid, i.e., that Verizon's multiplexing utilization factors are excessive (Exh. VZ-37, Part D-6, Workpapers).

Verizon should have separated the multiplexing equipment costs into three categories (bay cost, channel bank common equipment costs, and plug-in costs) because different utilization factors should apply to these three categories of equipment. For this and other reasons described above, we find that Verizon under-estimates its potential efficient utilization factors. To remedy these concerns, we direct Verizon to increase the eleven IOF utilization factors (i.e., all but the fiber) to 83 percent. In determining this level, we have taken into consideration Verizon's actual utilization of 0.65 to 0.70 and the utilization level of 90 percent, which, according to Verizon, triggers relief (Tr. 13, at 2505; Verizon Reply Brief at 132).

E. Digital Cross-Connect Frames Bundled with Dedicated Transport

1. Overview

Digital Cross-Connect System enables telecommunications providers to cross-connect electronically different speeds of dedicated transport (Exh. ATT-16, at 10). Verizon assumes the functionality of DCS in the estimation of its dedicated transport costs. AT&T/WorldCom do not oppose Verizon's inclusion of DCS costs in the interconnection portion of Verizon's IOF cost study, but contend that DCS should be optional at the termination end.

2. Positions of the Parties

a. Verizon

Verizon prices its dedicated IOF assuming the functionality of DCS, which provides advanced circuit aggregation and management functions within the transport network (Verizon Brief at 119). Verizon contends that, "the functionality provided by DCS in the forward looking Verizon MA architecture [is] inherent to the efficient provision of the dedicated transport UNE" (id., citing Exh. VZ-38-A, at 90-91). According to Verizon, the overall costs for dedicated transport without DCS would increase in relation to those costs calculated in Verizon's model assuming DCS (id. at 120). Verizon attributes this increased cost to its assessment that "numerous operational and management functions provided by DCS would still have to be performed, but through inefficient, manual processes" (id. at 119).

Responding to AT&T's arguments, Verizon states that AT&T claims that CLECs may not want to use DCS yet also acknowledges that dedicated transport UNEs require the DCS functionality to be provided efficiently (Verizon Reply Brief at 139). Verizon also states that, contrary to AT&T's assertion, "DCS applied for management functions at the termination ends of a circuit can be 'separated out as an additional option'" (id. at 139, citing Tr. 13, at 2511-2512). Furthermore, according to Verizon, whether its interconnection agreements specify that dedicated transport includes DCS as an option "is entirely irrelevant to determining the appropriate forward-looking architecture associated with the efficient provision of the dedicated transport UNE" (id. at 140). Verizon also states that "AT&T does not, and cannot, assert that Verizon MA fails to satisfy" the FCC requirement that ILECs provide access to DCS (id. at 140).

b. AT&T/WorldCom

AT&T does not oppose the inclusion of DCS in the interconnection portion of Verizon's IOF cost study but does contend that DCS at the termination ends of a circuit that a CLEC purchases as a UNE "can and should be separated" (AT&T Brief at 203). AT&T recommends that the terminal DCS cost be identified separately from Verizon's proposed rate for dedicated transport (id.). AT&T/WorldCom objects to Verizon's inclusion of DCS facilities within its overall dedicated transport costs because they contend that CLECs should be able to decide whether to purchase the service (id. at 202). AT&T/WorldCom claim that Verizon's inclusion of DCS contradicts the FCC requirement to offer DCS separately, relying on the FCC's statement that it "believe[s] that access to [DCS] will improve competitors' ability to design efficient network architecture, and in particular, to combine their own switching functionality with the incumbent LEC's unbundled loops" (id., citing Local Competition Order at ¶ 447). AT&T/WorldCom further emphasize that bundled DCS violates Verizon's interconnection agreements with AT&T and WorldCom because DCS should be an option where DCS equipment is available (id. at 203). AT&T and WorldCom therefore propose that the DCS at the termination ends of a circuit purchased as a UNE can and should be separated (id.).

AT&T contends that Verizon's point that DCS facilities should not be separated for interconnection DCS is irrelevant because "it deals only with interconnection DCS" and AT&T indicates that its witness did not remove the cost of DCS to interconnect SONET rings (AT&T Reply Brief at 131) (emphasis in original). AT&T asserts, however, that DCS "at the termination ends of unbundled DS0, DS1 and DS3 circuits physically can be separated and therefore should be priced separately from Verizon's fixed and per monthly dedicated transport costs" (id.). AT&T also contends that the New Jersey Board of Public Utilities recently adopted the costing method that AT&T proposes, and thus adopted DCS port costs per month for DS0, DS1 and DS3 terminations (id. at 132).

WorldCom contends that, contrary to Verizon's misstatement of Mr. Turner's position, Mr. Turner does not recommend removal of the DCS costs from the portion of Verizon's cost study that includes DCS investments associated with interconnection of facilities, but rather only from the portion of the study relating to circuit termination (WorldCom Reply Brief at 51).

3. Analysis and Findings

Verizon's IOF cost model includes the cost of DCS in its calculation of dedicated transport costs. Verizon's Special Access Tariff provides access to a type of DCS functionality called the Enterprise Network Reconfiguration Service, and the interconnection agreements between Verizon and AT&T and between Verizon and a WorldCom subsidiary offer dedicated transport both with and separately from DCS (Exh. ATT-16, at 10, 13-14). AT&T does not oppose Verizon's inclusion of DCS in the interconnection portion of Verizon's IOF cost study (i.e., from one ring to another ring), but does recommend that the Department direct Verizon to offer DCS as an option at the termination end of IOF circuits (AT&T Brief at 203).

Although Verizon indicates that "DCS applied for management functions at the termination ends of a circuit can be 'separated out as an additional option,'" it does not appear to be describing the level of DCS unbundling that AT&T intends (Verizon Reply Brief at 139, citing Tr. 13, at 2511-2512). Verizon states that "[t]hey can do whatever they want at the ends of the service," yet Verizon's cost study assumes DCS at the terminating end (Tr. 13, at 2513-2514). Verizon interprets AT&T's request as follows:

> Mr. Turner is pointing towards a particular service that is offered by Verizon in various forms in different jurisdictions, and here it's called enterprise service. And as I said, it's a service that uses DCS within it, a type of DCS, to provide certain management functions at the request of the customer that buys the service. That's a distinctly different issue than the issue of the DCS that's in the infrastructure. In fact, I think Mr. Turner has said he recognizes that's different. I think the argument is really about are we providing the stand-alone DCS function for him or are we including those costs somehow in our study? And the fact is, none of the costs that are for that kind of a service are included in our dedicated transport studies. The only DCS in our dedicated transport studies are the ones that are used to manage, connect, test, multiplex the dedicated transport circuits. If we were providing enterprise network service, there would be additional DCS and additional functionality (id., at 2516-2517).

According to AT&T/WorldCom's witness, "DCS provides unique capabilities that the CLEC may not need and therefore should not then bear the cost for something that they do not need" (Tr. 8, at 1530). AT&T and WorldCom do not recommend that Verizon remove DCS costs from the interconnection portion of its IOF cost study, but rather only from the termination end (id., at 1527-1528). We must then determine whether we should direct Verizon to offer DCS at the termination end as a UNE option separate from the portion of Verizon's IOF study relating to the termination of circuits, as AT&T/WorldCom request, or whether the issue is, as Verizon contends "entirely irrelevant to determining the appropriate forward-looking architecture associated with the efficient provision of the dedicated transport UNE."

The parties also offer different interpretations of paragraph 447 of the FCC's Local Competition Order, which states:

> Section 251(d)(2)(B) requires the Commission to consider whether the failure to provide access to an unbundled element "would impair the ability of the telecommunications carrier seeking access to provide the services that it seeks to offer." We have interpreted the term "impair" to mean either increased cost or decreased service quality that would result from using network elements other than the one sought. Certain commenters contend that unbundled access to these facilities would improve their ability to provide competitive local exchange and exchange access service. MCI, for example, argues that its inability to obtain unbundled access to trunks between an incumbent LEC's end offices raises its cost of providing local service. Accordingly, we conclude that the section 251(d)(2)(B) requires incumbent LECs to provide access to shared interoffice facilities and dedicated interoffice facilities between the above-identified points in incumbent LECs' networks, including facilities between incumbent LECs' end offices, new entrant's switching offices and LEC switching offices, and DCSs. We believe that access to these interoffice facilities will improve competitors' ability to design efficient network architecture, and in particular, to combine their own switching functionality with the incumbent LEC's unbundled loops.

Local Competition Order at ¶ 447 (footnotes omitted).

Verizon's inclusion of DCS investment in the portion of its IOF cost study that is associated with interconnection of facilities is uncontested and reasonable, and accordingly we approve such inclusion. However, Verizon has failed to demonstrate why it cannot offer DCS as an option at the termination end of circuits. TELRIC-based UNE prices should encourage efficient investment and practices by Verizon and CLECs. Allowing CLECs to determine whether they require DCS at the termination end of IOF circuits furthers this goal. Accordingly Verizon must include two options in its IOF cost study, where one corresponds with its as-filed bundled DCS option, and the other offers DCS at the terminating ends on an unbundled basis.

F. Weighted Average Distance Between Wire Centers

1. Overview

Verizon proposes a weighted average distance of 37.52 miles for the calculation of MOU common transport costs. AT&T and WorldCom claim that Verizon's proposed common transport costs are too high because they assert that the estimated weighted average distance between wire centers is too high. AT&T/WorldCom instead propose a weighted average distance of twelve miles for the calculation of common transport costs.

2. Positions of the Parties

a. Verizon

Verizon indicates that it "developed the weighted average distance between its wire centers by examining the actual mileage of every local and toll circuit in Massachusetts" (Verizon Brief at 122). Verizon assumes a common transport distance of 37.52 miles (Exh. VZ-37, Part C-2, Section 3, Line 5). Verizon asserts that its average distance figure is "effectively the same as the 'weighted average based on minutes of use'" calculation that AT&T's witness recommends (Verizon Brief at 122, citing Exh. ATT-16, at 19). As such, Verizon sees no need to recalculate its weighted average distance between wire centers (Verizon Brief at 122).

Verizon contends that AT&T/WorldCom's proposed use of twelve miles is unsubstantiated (Verizon Reply Brief at 143). Furthermore, Verizon argues that AT&T mischaracterizes the evidence by asserting that Verizon's circuit distance is based only on where the CLEC interconnects. Verizon states that it examines all trunk groups (id.). Verizon further contends that if it were to compute the weighted average mileage between wire centers using the basis of weighting that AT&T/WorldCom's witness proposed and the Erlang B engineering table[139] WorldCom suggested (the use of which Verizon opposes), the resulting calculation would be approximately 36.5 miles – a distance that still exceeds the twelve miles proposed by AT&T/WorldCom (id. at 144).

b. AT&T

AT&T claims that Verizon's estimated cost for common transport is too high because Verizon overstates the weighted average distance between wire centers (AT&T Brief at 207-208). AT&T asserts that there are two flaws in Verizon's calculation of its weighted average distance between wire centers. According to AT&T, Verizon did not investigate the number of transport minutes that traverse the IOF segments, but should have, and should have used these quantities to weight the mileage (id. at 208). According to AT&T, using this approach results in weighted average distances "in the range of 12 miles" in larger, less densely

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[139] See n.126 in Section VII, above, describing the Erlang B engineering table.

populated states, including Texas, Missouri and Kansas (id.). AT&T argues that the second flaw is that Verizon's circuit distance only accounts for where the CLEC interconnects and fails to consider the total demand for common transport in its network (id. at 209). As a result of these alleged flaws, AT&T proposes that "[t]he more appropriate distance of 12 miles accounts for both the common transport mileage between end offices as well as the common transport distance between end office and tandem switch" (id. at 208).

AT&T argues that "there is no practical way that Verizon can compute a weighted average distance of 37.52 miles for such a dense and small state as Massachusetts" and further contends that there is no record evidence to "support or permit investigation of Verizon's claim" (AT&T Reply Brief at 135). In the absence of such evidence, AT&T uses an example to illustrate what it considers to be the unreasonableness of Verizon's assumption. According to AT&T, in order to derive a weighted average distance of 37.52 miles, all calls within Boston that travel between close COs (e.g., less than a five-mile distance) would need to be weighted with a corresponding number of call traveling an average distance of approximately 70 miles. AT&T considers it unlikely that CLEC customers would place enough calls of distances of 70 miles to balance the short-distance calls within Boston (id.). Therefore, AT&T recommends that the Department reject Verizon's proposed assumption of 37.52 miles as the weighted average distance.

c. WorldCom[140]

WorldCom expands on AT&T's criticism of Verizon's methodology for calculating the weighted average distance between wire centers: "Rather than developing a weighted average

140 WorldCom supports AT&T's position (see WorldCom Brief at 63-66).

based on the minutes that travel over the circuits between offices, Verizon weights the average distance based on the number of trunks between offices" (WorldCom Brief at 65). WorldCom lists three reasons that it considers this approach inappropriate. First, WorldCom argues that Verizon's trunks are not an appropriate measure of forward-looking efficiencies because Verizon utilizes its trunks inefficiently (id.). Second, WorldCom states that "it is simply wrong to assume that looking at the number of trunks is an adequate substitute for measuring the number of minutes because trunk efficiency increases as the size of a trunk group increases" (id.). Third, according to WorldCom, Verizon overstates costs because "larger trunk groups more efficiently fill a DS-1" as trunk groups are typically installed in multiples of 24 trunks (id. at 66).

3. Analysis and Findings

Contrary to the CLECs' concern, Verizon's cost study does not appear to limit its mileage analysis to only those circuit distances where CLECs interconnect, but instead states that:

> Common Transport is one of the Unbundled Elements available to CLECs. It entails carrying usage between end offices or from an end office to a tandem, depending on where the CLEC is interconnected with the Verizon network. This study considers only the facilities between offices, including the terminations on those facilities (Exh. VZ-37, Part C-2, Section 1.1).

Furthermore, Verizon states that it "developed the average miles by examining the actual mileage of every local and toll circuit in Massachusetts" (Exh. VZ-38, at 94). Therefore, Verizon appropriately includes an examination of all relevant circuits and thus AT&T/WorldCom's concern that Verizon's circuit distance only accounts for where the CLEC interconnects is moot.

Intervenors also question Verizon's methodology for computing the weighted average distance. Verizon explains that "[w]hat the 37.52 actually represents is a weighted average based on the number of circuits that are in each trunk group" (Tr. 13, at 2500). However, AT&T and WorldCom contend that the weighting should be based upon the number of minutes rather than the number of circuits (AT&T Brief at 208; WorldCom Brief at 65-66). Their witness explains this distinction as follows:

> They have affirmatively said that they calculated their distance from simply taking circuit mileages, and that's just on its face wrong. So in other words, if you had two central offices in downtown, that would probably have a very close proximity to one another and have a very high level of usage between one another, you wouldn't just want to take the one mile – let's just say, arguably – one mile between those offices and average it with, say, a 20-mile distance that you might find out in Springfield between two offices that might not have a lot of traffic in common. You would want to weight that one mile with however many millions of minutes that you had there and then take the miles in Springfield and weight it with the number of minutes there, which would likely be lower. And that's what I was suggesting, is that in places where I've seen weighted-average calculations done, you tend to get distances that are around 12 miles (Tr. 8, at 1516-1517).

Contending that it used the methodology that AT&T/WorldCom proposes, Verizon states that "switched trunks between end offices are engineered based on the amount of traffic or minutes of use it's anticipated they're going to carry, so the more minutes of use, the more trunks; and since we're weighting it by trunks, we're effectively weighting it by minutes of use" (Tr. 13, at 2501). In its reply brief, Verizon contends that if it were to calculate the weighted average mileage between wire centers based on usage and using the Erlang B table, then the average local trunk group distance would be reduced from 37.52 miles to approximately 36.5 miles (Verizon Reply Brief at 144), but Verizon does not explain the basis of its calculation. Although this assertion implies that Verizon is able to compute a weighted average based upon usage, Verizon asserts that the "collection of usage data for each trunk group would be an extremely time consuming task" (id. at 144 n.130).

Although Verizon contends the approaches are effectively the same, there is an important distinction between weighting distances based upon the quantity of IOF circuits and weighting distances based upon the quantity of IOF minutes. Because Verizon computes per-minute common transport costs, the latter methodology is more appropriate. Although AT&T/WorldCom's proposed distance of twelve miles is not based on an analysis of Verizon's data, but rather is based on "experience from doing these types of studies in other jurisdictions," they provide a persuasive argument that it is implausible that an average, one-minute local call in Massachusetts travels, on average, 37.52 miles (Exh. ATT-16, at 20-21). We reject Verizon's proposed use of weighting distances by the quantity of circuits and direct Verizon to re-compute the weighted average distance based on a representative sample of the data in its Trunk Information Recordkeeping System.

G. Least Cost Technology Vendor

1. Overview

The CLEC Coalition proposes that the Department require Verizon to base its IOF cost studies for SONET equipment on 100 percent Fujitsu-provided equipment as the least-cost technology vendor. Verizon instead proposes a ratio of 90 percent Fujitsu equipment and 10 percent Lucent equipment.

2. Positions of the Parties

a. Verizon

Verizon claims that the CLEC Coalition's position of using 100 percent Fujitsu equipment is inappropriate because it is neither efficient nor practical to utilize only one supplier (Verizon Reply Brief at 145). Verizon considers unrealistic the assumption that in a single supplier environment an ILEC could purchase all of its equipment from that supplier at extraordinary discount levels (id.). Verizon states that its assumption of an efficient mix of suppliers is consistent with TELRIC and reflects "the rational behavior of an efficient competitive firm" (id.).

b. CLEC Coalition

The CLEC Coalition proposes that the Department require Verizon to base its IOF cost studies for SONET equipment on 100 percent Fujitsu because the cost of Lucent equipment is higher than that of equipment supplied by Fujitsu (CLEC Coalition Brief at 83-84). The CLEC Coalition states that, "while Verizon has already adjusted the technology mix in favor of Fujitsu, there is still considerable use of the more expensive Lucent equipment that would not be present in a least cost forward looking network" (id. at 84). The CLEC Coalition argues that the TELRIC methodology requires one to forecast forward-looking costs on the least cost, most efficient technology, which the CLEC Coalition maintains is Fujitsu. The CLEC Coalition states as further support that, "SBC has deployed Fujitsu in all of its thirteen states" (id.).

3. Analysis and Findings

Although the CLEC Coalition states that SBC has deployed Fujitsu in all of its 13 states, it does not assert that SBC uses only Fujitsu (Tr. 7, at 1396). Verizon's 90/10 ratio of Fujitsu to Lucent equipment is reasonable because we would not expect a competitive provider to depend on a sole supplier of equipment (see also Section VII). Using more than one supplier would be consistent with efficient management, as it would tend to discipline all suppliers used. Accordingly, the Department approves Verizon's proposed combination of Lucent and Fujitsu equipment in its IOF costs study.

IX. COLLOCATION

A. Introduction

Verizon's collocation cost study (Exh. VZ-28, Part C-A) recovers those costs associated with the placement of a CLEC's telecommunication equipment in an ILEC's CO in order to connect to the local exchange network or to access UNEs. There are nine different types of collocation arrangements.[141] In this Order, we discuss primarily the specific rate elements for physical collocation,[142] not only because issues were raised regarding the rate

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141 The nine collocation offerings are: Physical, Secured Collocation Open Physical Environment ("SCOPE"), Cageless Collocation Open Environment ("CCOE"), Virtual, Dedicated Transit Service ("DTS"), Dedicated Cable Support ("DCS"), Adjacent On-Site, Adjacent Off-Site, and Remote Terminal.

142 The 14 rate elements for Physical Collocation are: Application Fee; Engineering & Administration Fee; Space Conditioning Charge; Building Expense Charge; Point of Termination ("POT") Bay Frame Charge; DC Power Consumption Charge; DC Power Distribution Charge; Conduit Fee; Cable Pull and Splice Charge; Service Access Charge POT Bay Termination; Service Access Charge Cable and Frame Termination; Escorting Fee; Security Access Cards Charge; and Cable Rack Support Fee.

elements for this type of arrangement, but also because many rate elements carry over to the other types of collocation arrangements.

Verizon states that its costs are derived from general contractor invoices, investment data, and estimated work times and expenses (Exh. VZ-28, at 3). Throughout its cost studies, Verizon applies ACFs and other loading factors[143] to estimate its forward-looking expenses. Generally, in preparing its cost studies, Verizon utilizes methodologies similar to those previously approved by the Department in the Consolidated Arbitrations and the D.T.E. 98-57 proceedings. However, two rate elements that are currently available in Tariff No. 17, Space Conditioning and DC Power, have been broken out into additional elements to allow CLECs more ordering and service options.[144]

B. Administration and Engineering Fee

1. Overview

The Administration and Engineering fee seeks to recover the costs associated with processing and implementing a CLEC's request to establish a physical presence in a particular CO (i.e., to collocate). The Application Fee is a portion of the Administration and Engineering fee and is collected when the CLEC submits an application. The remainder of the Administration and Engineering fee is billed after the job is completed. The following

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143 Other loading factors include Common Overhead factor, Installation factor, and Land and Building factors.

144 The current Space Conditioning charge has been separated into an Administration and Engineering fee and a Space Conditioning charge in this proceeding to identify the costs incurred to process individual collocation applications from the costs to physically prepare collocation areas. The current DC Power charge has been broken into two elements, DC Power Consumption and DC Power Distribution, to allow CLECs to order power usage requirements separate from fused requirements.

discussion focuses on the methodology for determining the Administration and Engineering fee.

To calculate the Administration and Engineering fee, a Verizon service cost analyst contacted every workgroup involved in provisioning collocation arrangements and obtained detailed work descriptions and associated labor hours for each activity involved in the administration and engineering of collocation. Instructions were provided to the relevant workgroups that reported work time must be based on productive time, and that efficiencies must be factored into the results. The service cost analyst calculated the total labor cost by summing the individual workgroup labor hours multiplied by their associated rates. The Common Overhead and Gross Revenue Loading Factors were applied to the summed total to determine the Administration and Engineering fee. The CLEC Coalition claims that Verizon has overestimated the work times associated with processing and engineering collocation applications.

2. Positions of the Parties

a. Verizon

Verizon argues that its proposed Administration and Engineering fee is based on forward-looking time estimates necessary to process and engineer collocation arrangements. According to Verizon, the CLEC Coalition's claim of excessive review processes is faulty because numerous workgroups must review the application "to determine what work must be performed by that individual work group" (Verizon Brief at 244) (emphasis in original). Verizon points out that individual work groups have specific tasks to perform in processing a collocation application and "must undertake their own, non-overlapping 'reviews'" (id.).

In addition, Verizon discounts the CLEC Coalition's claim that most of the information needed to plan collocation is contained within CO records that are maintained on a regular basis. Verizon insists that while CO records are part of the review process, approximately 70 of the 95 hours needed to fully process the application are devoted to defining the specific requirements of that application, preparing the engineering requirements, and administering the process (id.).

Finally, Verizon states that the CLEC Coalition produces no evidence to support "the spurious charge that Verizon [ ] employees are naturally biased against CLEC collocators, and therefore fraudulently raise the time-estimates associated with certain activities" (Verizon Reply Brief at 243). According to Verizon, the CLEC Coalition fails to support its criticisms of Verizon's Administration and Engineering fee; therefore, the Department should adopt Verizon's cost study.

b. CLEC Coalition

The CLEC Coalition argues that Verizon is proposing Administration and Engineering fees that "are largely driven by exorbitant labor time estimates" (CLEC Coalition Brief at 202). First, the CLEC Coalition contends that Verizon's costs are based on an "excessive amount of hours involved in checking on the feasibility and availability of collocation space" (id. at 200). According to the CLEC Coalition, an efficiently managed CO should maintain all the information necessary to plan collocation space on an ongoing basis (id., citing Exh. CC-5, at 11). The CLEC Coalition further contends that if these records were properly kept up-to-date, then this should result in a minimal amount of time to plan collocation space (id. at 200).

Second, the CLEC Coalition states that Verizon's excessive work time estimates are a result of an "upward bias" (id. at 202). Pointing to the instructions provided to Verizon's workgroup subject matter experts that were submitted in Exh. CC-VZ 4-4, which states that their responses would be used to revise Verizon's collocation rates, the CLEC Coalition warns that Verizon planted "the seeds of upward bias" (id.).

Finally, the CLEC Coalition argues that Verizon's work time estimates are not forward-looking (id. at 203-204). The CLEC Coalition contends that, even though Verizon instructed its subject matter experts to assume the most efficient forward-looking process, Verizon did not explain to its experts how to make current work time estimates forward-looking (id.). Furthermore, the CLEC Coalition argues that:

> Verizon admitted that the times are based on current processes and organizational structure. The times were not adjusted by any type of forward-looking adjustment factor. No independent validation of the times were made by an objective third party. Verizon did not analyze its work process to determine if the processes are indeed forward-looking and [least] cost. Verizon also did not conduct any time and motion studies (id. at 203).

The CLEC Coalition argues that the work time estimates are excessive and upwardly biased and have not been proven to be forward-looking; consequently, it recommends that the Administration and Engineering fee be based on the cost to maintain Verizon's CO records and apportioned according to the square footage occupied.

3. Analysis and Findings

The CLEC Coalition contends that Verizon expends excessive time in processing collocation applications because of redundant application reviews and inefficient management of CO records (Verizon Brief at 244). Verizon responds to the redundant application review charge by noting that the different work groups all must review the application because each group has a different focus and responsibility in the application process. The Department finds Verizon's response persuasive for the reasons discussed below. The work time estimates Verizon submitted in response to Exh. DTE-VZ 2-1 identify numerous activities each work group must undertake in its role to process a collocation application. Although most of the work groups identify "review" as a task performed, the Department notes that the review process is markedly different for each group, with reviews of different documents and from a completely different standpoint with respect to job responsibility, a point that the CLEC Coalition acknowledges as valid (see Tr. 7, at 1284).

The CLEC Coalition argues that, "from [Verizon's] cost studies one gets the impression that [Verizon] does not know the lay-out of its own CO and that extensive site surveys and other inspections are needed before a collocation space can be made available" (Exh. CC-5, at 10). But, as Verizon states, the administration and engineering of a collocation application includes activities not limited to review of CO records. Verizon's time estimate submissions in Exh. DTE-VZ 2-1 are further proof that various tasks by different workgroups are necessary to process collocation applications and these processes are not limited to space assessments or CO record reviews. The CLEC Coalition's recommendation to charge CLECs the cost of maintaining CO records and apportion it according to CO square footage occupied is not a reasonable estimate of the costs Verizon will incur to process and implement collocation applications. As has been identified, there are numerous processes that must occur in addition to reviewing CO space; therefore, the Department is not convinced that the CLEC Coalition's recommendation would allow Verizon to recapture fully its expected costs associated with the administration and engineering of collocation requests.

Finally, the CLEC Coalition argues that Verizon has failed to show its practices are forward-looking or that its time estimates are not upwardly biased (CLEC Coalition Brief at 202). Although Verizon disputes the CLEC Coalition's contentions, noting that its instructions to the survey respondents ask them to "assume the most efficient forward-looking process" (Exh. CC-VZ 4-4, Att. 1), the Department concurs with the CLEC Coalition. More precisely, we find that Verizon's time estimates for the Administration and Engineering fee cost study do not represent an acceptable sampling of employee work times in each workgroup. For instance, according to Verizon, the subject matter experts determined the time estimates by the following process:

> The individuals . . . got together and they talked about the functions that they were actually providing the hours for, and one person had said that they thought it took them an hour and the next person said that they thought that on the average it may have been an hour and a half, then those numbers would have been submitted as an average, if it said 'average.' If they collectively decided when they spoke together that, 'No, I would overall generally agree that it takes all of us an hour,' that was a consensus (Tr. 6, at 1074).

This sampling method is questionable and does not support Verizon's contention that forward-looking efficiencies were factored into its time estimates.

Moreover, in the Phase 4-L Order, the Department found that the limited sample sizes "introduce[d] an element of bias into the estimation process and impair[ed] its reliability." Phase 4-L Order at 25. The Department further found "a strong likelihood of bias when employees are instructed to provide estimates that they are told will be used to derive charges for their employer's competitors." Id. In this proceeding, given Verizon's determination of the work time estimates for each workgroup by a limited sample size consisting of just a few individuals, and its instructions to the experts stating that the purpose of the estimates is "to revise the rates we charge to CLECs for Collocation in our Central Offices," we conclude that there is a high probability that an upward bias exists in the work times (see Exh. CC-VZ 4-4, Att. 1).

In addition, during hearings, the Department asked Verizon if written records were available to validate the reasonableness of its time estimates. Verizon responded by stating, "We really, really try to ensure that they know how important these hours are . . . Other than that, I don't have anything on paper to show you, outside of what I provided you" (Tr. 6, at 1130-1131). However, in its presentation of the NRC Model, Verizon has shown that it does have the ability to readily, and more precisely, estimate its labor time. Accordingly, the Department finds that Verizon has not validated that its Administration and Engineering fee work time estimates are forward-looking and free of bias. Previously, in both D.T.E. 98-57 and Phase 4-L of the Consolidated Arbitrations, the Department also found that Verizon failed to support its work time estimates and associated cost studies. See Tariff No. 17 Order at 195, 201; see also Phase 4-L Order at 24-25. Verizon must correct the flaws and perform a reliable sampling of work times useful to a forward-looking estimate of cost.

Nevertheless, we believe that Verizon's failure to properly support this fee should not deny it cost recovery outright. In the Tariff No. 17 Order at 202, we ordered Verizon (then Bell Atlantic) to reduce its virtual collocation Engineering and Implementation fee by ten percent to account for future efficiencies, and, because the same principle applies here, we adopt that same approach here. Accordingly, the Department orders Verizon to reduce its Administration and Engineering fee by ten percent to account for future efficiencies. Likewise, because we find there is a strong likelihood that Verizon's time estimates are upwardly biased, we require Verizon to apply an additional ten percent reduction. Therefore, Verizon is directed to reduce its Administration and Engineering fees by 20 percent.[145] In future TELRIC rate proceedings, the Department requires Verizon to estimate its workgroup labor times based on a methodology that produces more accurate estimates, and that takes into account forward-looking efficiencies, such as the methodology and templates used in the approved NRC model.

C. Building Expense

1. Overview

The Building Expense charge recovers the building improvement costs associated with the CLEC occupancy of space in Verizon COs. Verizon developed this recurring cost by dividing the total gross investment for all Massachusetts COs (less collocation investments) by the total assignable square feet to yield an investment per assignable square foot, which was then multiplied by the Land and Building ACF, and, finally, the result was divided by twelve to derive the monthly charge per assignable square foot. The Common Overhead and Gross Revenue Loading factors were then applied to determine the Total Monthly Cost per Square Foot.

In the Phase 4-G Order at 23-24, the Department found that the "TELRIC methodology requires each network element to carry its own weight in the hypothetical reconstructed telecommunications network," and approved the Building Expense rate element and associated

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145 This reduction shall be applied to the entire Administration and Engineering fee, including the portion designated as the Application fee. Moreover, given this reduction, we direct Verizon to review whether the proposed level of the Application fee remains appropriate, and, if not, Verizon shall submit any revision in its compliance filing.

inputs. In this proceeding, the CLECs argue that the investments used by Verizon in its Building Expense cost study are not forward-looking or TELRIC-compliant.

2. Positions of the Parties

a. Verizon

Verizon claims that AT&T makes a "flawed argument in opposition to Verizon's fully justified central office building investments" (Exh. VZ-29, at 9). According to Verizon, "it is absurd to suggest that all building investment increases must result in assignable space increases" (id. at 6). Rather, Verizon maintains, situations exist where improvements must be made to its COs that do not result in an increase to the assignable square footage. For example, Verizon explains the increase in the building investment for the Chelmsford and Gloucester COs as being related to conversions that required new heating, ventilation and air conditioning ("HVAC") rooms, and a switch conversion in the Tewksbury CO that "required a temporary addition to the central office while new walls, flooring, lighting, ductwork, air conditioning, and a new roof were installed" (id. at 8). Verizon further argues that its building investments are properly calculated and justified in that upgrades to CO facilities and the network will continue to occur in a TELRIC environment (Verizon Reply Brief at 242).

Contrary to the CLEC Coalition's argument, Verizon contends that it does not double-recover Space Conditioning costs in this monthly recurring fee. According to Verizon, the total gross building investments are accounted for under field reporting code ("FRC") 10C, whereas collocation-related space conditioning costs are accounted for in FRC 13C; thus, Verizon argues, its "building expense and space conditioning charges cannot possibly double recover costs" (Verizon Brief at 248). In addition, Verizon points out that the CLEC Coalition does not identify any cost element nor does it provide any evidence to support its double-recovery contention. For these reasons, Verizon urges the Department to dismiss the CLEC Coalition's double-recovery argument.

Finally, Verizon refutes the CLEC Coalition's comparison of "Class B" office space with Verizon's CO space by noting that the CLEC Coalition's "own testimony demonstrates, because of the specialized nature of CO equipment and the special burdens that such equipment places on a structure, there can be no meaningful comparison" (id. at 252-253). In addition, Verizon dismisses the CLEC Coalition's comparison of rates at a collocation hotel with those for collocating at Verizon's COs. To begin with, Verizon argues that there is no basis to assume the rates offered by Universal Access, a collocation hotel in Boston, are "market" rates or that they cover the hotel's costs (id. at 249). Furthermore, Verizon argues that a comparison of the rates may be "utterly meritless" because "a CLEC hotel does not require the same conditioning and equipment required in a central office. And, . . . the CLEC in a CLEC hotel is not connecting to Verizon MA within that hotel, eliminating the need for cross-connects, termination bays, and other equipment" (id. at 250). Verizon asserts that the CLEC Coalition's "entire analysis is not only irrelevant to determining Verizon MA's forward-looking collocation costs, it is inaccurate and misleading" (id. at 251).

b. AT&T

AT&T claims that "Verizon includes in its forward-looking costs the costs of maintaining its existing network while building a new network and transition costs associated with moving its operation from one set of facilities to another" (AT&T Brief at 230). AT&T concludes that the end result is that CO building investments have increased over the past three years while the assignable square footage of these buildings has remained the same or decreased. AT&T insists that Verizon's investments used in its cost study are not consistent with TELRIC because "TELRIC requires that costs be developed from a total demand perspective" (AT&T Reply Brief at 156). The costs for temporary structures and renovations added into Verizon's purported forward-looking 1997 building investments, according to AT&T, do not comply with this principle in that "you can't build effectively two buildings to do the work of one building, [and] divide it by the [area] of only one building" (AT&T Brief at 232, citing Tr. 7, at 1428). To remedy this inconsistency, AT&T recommends that Verizon's Building Expense cost study be calculated from the investments used in Phase 4-G of the Consolidated Arbitrations. According to AT&T, the Department has already approved these data and they more closely represent TELRIC costs for Verizon's COs than Verizon's proposed building investments.

c. CLEC Coalition

The CLEC Coalition concurs with AT&T's assertion that Verizon's increased building investments are not TELRIC-based (CLEC Coalition Brief at 212). Moreover, the CLEC Coalition claims that Verizon's imposition of both a Building Expense charge and a Space Conditioning charge results in double-recovery. According to the CLEC Coalition, Verizon's Building Expense charge assumes the costs of completely conditioned COs to house telecommunications equipment. The CLEC Coalition identifies "the costs of entrances, doors, partitions, floor tiles, general overhead lighting, convenience outlets and painting walls, infrastructure support systems, such as heating, ventilation, air conditioning, grounding and AC power" as being included in Verizon's building investments (CLEC Coalition Reply Brief at 14). Utilizing information provided by Verizon, the CLEC Coalition shows, in table format, how these same elements are recovered in Verizon's Space Conditioning charge (CLEC Coalition Brief at 210). In addition, the CLEC Coalition notes that Verizon admits that these same items are recovered in both the Building Expense fee and Space Conditioning fee, but attempts to justify this "by stating that the Building Expense (rent) charge 'does not include the additional costs for installing [the items] associated with space conditioning for collocation'" (id., citing Exh. CC-VZ 4-15) (emphasis in original).

The CLEC Coalition does not agree with Verizon's attempts to qualify this because, it insists, no additional costs are warranted since the Building Expense fee should already include costs for installation (CLEC Coalition Brief at 210). To ensure Verizon does not recover these costs twice, the CLEC Coalition recommends that the Department "eliminate the cost items from either the Building Expense (rent) charge or the space conditioning charges," with elimination of the space conditioning charge, according to the CLEC Coalition, being the better choice (id. at 211).

The CLEC Coalition also argues that a comparison of Verizon's rates to the rates charged for similar office space results in rates that "are somewhat higher to nearly double the market rate for Class B office shells" (id. at 222). The CLEC Coalition contends that tenants in a competitive market would not pay Verizon's proposed rates. To identify forward-looking collocation costs and demonstrate the excessiveness of Verizon's rates, the CLEC Coalition compared Verizon's rates with those charged by a Boston collocation hotel. The CLEC Coalition argues that it utilized the same rate elements presented in Exh. VZ-28 for its analysis and that Verizon's criticisms of such a comparison are "without merit" (see CLEC Coalition

Reply Brief at 17). From its rate comparison, the CLEC Coalition concludes that Verizon "still clings to its old structures, equipment and standards, and refuses to consider reengineering its processes and practices . . . Verizon then seeks to impose the costs of these outdated and inefficient practices on CLECs through monopoly rents and charges" (id. at 19).

3. Analysis and Findings

In the Phase 4-G Order at 23, the Department stated that "[b]uilding cost is an appropriate component to include in a TELRIC analysis because it is a forward-looking cost associated with a UNE." In that same proceeding, the Department also approved Verizon's Space Conditioning charge. Here, the Department finds the CLEC Coalition's allegation of double-recovery to be unsupported. Verizon accounts for the modifications to its COs and collocation spaces separately through different accounting codes. In addition, Verizon explains that the Building Expense charge is apportioned based on the amount of square footage occupied by a collocator, and "is used as a substitute for VZ MA's Land and Building Investment Factors which [are] applied to capture building costs associated with the portion of the building occupied by VZ MA purchased equipment, whether for itself or for CLECs" (Exh. CC-VZ 4-13). Thus, the fundamental difference between the Building Expense and Space Conditioning charges is that the former recovers costs associated with investments to the central office as a whole, whereas the latter recovers investments specific to collocation space. We also note that the FCC recognizes that ILECs may incur additional incremental space conditioning costs as a result of collocation, and established minimum requirements to ensure cost recovery and to allocate costs equitably. Advanced Services Order at ¶ 51.

With regard to the building investments used in Verizon's cost study, even though Verizon's building investments have increased since the Consolidated Arbitrations filing, this does not per se mean that they are not TELRIC compliant. We find that the FCC's TELRIC principles require us to assume existing CO locations and structures, but with efficiently reconfigured interior layouts. Local Competition Order at ¶ 685; Phase 4-G Order at 13. Even with the assumption of an efficiently reconfigured CO, the Department expects that additional investments to facilities will be needed to meet demand over the course of this study period. Furthermore, we note that structural maintenance and renovations as a result of expansion benefit not only Verizon, but also the CLECs, and in order to maintain the operation of its network while this growth occurs, temporary structures may need to be built to house essential network facilities.

If the Department were to agree with AT&T that "it's not TELRIC to build a temporary building and include that in the forward-looking cost, renovate an existing building, include that in the forward-looking cost," then the Department would be forced to require Verizon to calculate its building investment based on all new COs, built from the ground up (Tr. 7, at 1428-1429). As Verizon points out, and the Department agrees, "[t]he acquisition of real estate and construction of central offices at forward-looking prices that would have to be assumed under such a model would likely be staggering in a totally reconstructed network" (Verizon Reply Brief at 236-237). In fact, AT&T does not recommend using the investments for a brand new "built from the ground up" CO, but rather advocates using existing investments from the Consolidated Arbitrations. The Department agrees with Verizon that the forward-looking approach is to renovate an existing CO rather than building a new CO.[146] Accordingly, the Department finds that the inclusion of renovations, including temporary structures, in Verizon's Building Expense charge is reasonable.

Finally, the FCC adopted TELRIC as the model that best replicates the costs incurred in a competitive marketplace. See Local Competition Order at ¶ 679. Although the CLEC Coalition argues that the rates charged by collocation hotels best represent the costs that would be found in a competitive market, and that Verizon's rates are derived from its monopoly status (CLEC Coalition Brief at 217-220), the Department finds this comparison unreasonable. Collocation hotels are not an adequate measure of competitive market prices for interconnection because the facilities are not reasonably comparable to Verizon's. Infrastructure and ancillary equipment in collocation hotels, or Class B office space, have not been shown to be comparable to Verizon's COs. In addition, carriers do not have access to local loop facilities from a collocation hotel, and therefore do not necessarily incur comparable costs. Thus, collocation hotels, which lack the same facilities, cannot be used to make a reasonable assessment of costs that would exist in a competitive environment. Accordingly, we approve Verizon's Building Expense charge.

D. Space Conditioning

1. Overview

The Space Conditioning Charge seeks to recover the costs necessary to condition physical collocation areas within a CO, which may include the following: securing entrances;

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[146] See Section III.C (Economic Issues) above, for further discussion of what constitutes a forward-looking approach.

installing new doors, partitions, floor tiles, general overhead lighting, and convenience outlets; painting walls; HVAC; and grounding and AC power distribution system modifications or augments. Verizon proposes to apply this charge to both initial and subsequent physical collocation requests.

Verizon calculated its nonrecurring Space Conditioning costs based on a sample of 61 initial and 91 subsequent jobs. From each job, Verizon collected data detailing the type of collocation arrangement, the assignable square footage of newly conditioned collocation areas (excluding common areas), the total cost of the job, conditioning costs specific to initial or subsequent collocators, and assignable square feet occupied by initial or subsequent collocators. The Space Conditioning cost is split into two components: a per square foot room conditioning cost, and a CLEC-specific conditioning cost.[147]

The CLEC Coalition argues that the Building Expense rate element already recovers the Space Conditioning costs.[148] In addition, the CLEC Coalition asserts that Verizon overestimates its space conditioning costs, applies an incorrect cost recovery method, and does not provide refunds to CLECs when vacating its collocation arrangement.

2. Positions of the Parties

a. Verizon

Verizon asserts that its Space Conditioning charges are intended to recover the forward-looking costs to condition collocation space and notes that the Department approved this cost

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[147] This cost methodology was outlined by the FCC as a means to distribute equitably the costs of conditioning the entire collocation area to both initial and subsequent collocators. See Advanced Services Order at ¶ 51.

[148] See Section IX.C, above, for discussion of the Building Expense.

element in its Phase 4-G Order "over CLEC objections that it was not TELRIC-compliant" (Verizon Brief at 246). In addition, Verizon points out that the FCC has deemed that space conditioning costs incurred can be appropriately recovered under TELRIC, and that its study was approved by the Department in 1998 with only one concern regarding the limited sample size. Verizon argues that because it has more experience provisioning collocation and has included many more jobs in its sampling for its space conditioning cost study, Verizon's Space Conditioning study addresses the Department's prior concern and therefore reflects "the economies of scale and efficiencies produced by performing multiple collocation space installations" (id. at 246-247).

Verizon disagrees with the CLEC Coalition's contention that vacated collocation space was not taken into consideration in the cost study. According to Verizon, vacating collocators receive a pro-rated credit of their space conditioning charge when that space is re-occupied. However, if that space is not subsequently occupied, Verizon argues that it should not be required to provide a pro-rated credit to the vacating CLEC because the space was prepared solely for the benefit of the CLEC, and Verizon should not have to absorb the remaining costs associated with that conditioning. In addition, Verizon explains that "any conditioning work done to that already conditioned space is treated as a piece of the initial collocation work, and a recovery of only one space conditioning fee occurs for all the work done" (Verizon Reply Brief at 237 n.222) (emphasis in original). Applying its space conditioning charges in this manner, according to Verizon, ensures no double recovery and properly accounts for vacated pre-conditioned space.

Verizon points out that contrary to the CLEC Coalition's argument against Space Conditioning charges for Secured Collocation Open Environment ("SCOPE") and for Cageless Collocation Open Environment ("CCOE" or "cageless") arrangements,[149] the FCC has identified conditioning costs for cageless collocation as fully recoverable through its Space Conditioning charge. Verizon also argues that SCOPE arrangements do not differ from traditional physical caged collocation except that numerous CLECs may share one cage, and that therefore, space conditioning charges will occur.

Finally, in response to the CLEC Coalition's barrier to entry claim, Verizon points out that currently it offers smaller CLECs an opportunity to reimburse Verizon for space conditioning charges through a three-year amortized payment option. Verizon maintains that, although its space conditioning charges are rightfully recovered on a nonrecurring basis, it has offered, in accordance with FCC pricing principles, this payment option to address the CLECs' concerns.

b. CLEC Coalition

The CLEC Coalition argues that Verizon's Space Conditioning charges are flawed for the following reasons: (1) they are based on an invalid sample; (2) no conditioning is necessary for SCOPE/CCOE arrangements; (3) costs should be recaptured on a recurring, rather than nonrecurring, basis; and (4) refunds are not provided to CLECs when they move out of a collocation arrangement.

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149 SCOPE allows a CLEC to install one or more equipment bays in a collocation cage shared with other CLECs. CCOE allows a CLEC to place its equipment adjacent to Verizon's equipment line-ups.

First, the CLEC Coalition argues that Verizon's failure to include situations where no space conditioning occurred in its cost sampling produces an inflated nonrecurring charge. According to the CLEC Coalition, Verizon's sample only includes invoices when conditioning work was done and ignores those instances when no conditioning would be required. The CLEC Coalition points out that Verizon has identified "approximately 140 instances where CLECs vacated their space through June 15, 2001" and that "there are 520 pending requests to vacate space as of June 15, 2001" (CLEC Coalition Brief at 214). Because, argues the CLEC Coalition, available pre-conditioned, vacated space should be included in the Space Conditioning cost study, it recommends the Department "make a downward adjustment in the charges to reflect the fact that the sample Verizon used ignored those situations where no conditioning would be needed" (id.).

Second, the CLEC Coalition insists that Space Conditioning charges for SCOPE/CCOE collocation arrangements "are clearly unwarranted" (id.). The CLEC Coalition alleges that SCOPE/CCOE arrangements do not differ from virtual collocation in terms of placement within a CO location. Because virtual collocation is not assessed a space conditioning charge, the CLEC Coalition argues that SCOPE/CCOE should not be assessed this charge as well. Furthermore, the CLEC Coalition argues that efficiently provisioned SCOPE/CCOE arrangements would be placed in CO space pre-designated to house telecommunications equipment (id. at 214-215). Therefore, the CLEC Coalition claims that Verizon's assessment of Space Conditioning charges to SCOPE/CCOE arrangements results in the recovery of costs Verizon should not incur.

Third, the CLEC Coalition perceives the recovery of Space Conditioning charges on a nonrecurring basis as a barrier to entry. Citing FCC rules, the CLEC Coalition notes that, "[s]tate commissions may, where reasonable, require incumbent LECs to recover nonrecurring costs through recurring charges over a reasonable period of time" (id. at 215, citing 47 CFR § 51.507(e)). Consequently, the CLEC Coalition urges the Department to require Verizon to recover Space Conditioning costs as a recurring charge. In support of this request, the CLEC Coalition asserts that space conditioning is no different than Verizon's cost recovery for loop facilities, where Verizon recovers its up-front loop investments on a recurring basis (id. at 215). The CLEC Coalition further contends that conditioned CO space does not benefit a single CLEC, but would be used by other CLECs, Verizon, or Verizon affiliates. Therefore, the CLEC Coalition argues, there is no risk to Verizon from the up-front investments because that space will eventually be utilized, thus justifying recovery on a recurring basis.

Finally, the CLEC Coalition argues for the Department to require Verizon to refund, rather than credit, pro-rated Space Conditioning charges paid when a CLEC vacates its collocation space. The CLEC Coalition points out that Verizon has stated that while it "does not offer refunds per se, Verizon MA offers a credit to vacating collocators if a subsequent collocator occupies the same arrangement" (id. at 216, citing Exh. VZ-29). The CLEC Coalition insists that the adjustment should be as a refund, because a credit does not benefit a CLEC no longer operating in the state. In addition, the CLEC Coalition asserts that Verizon is the ultimate beneficiary of this conditioned space and "will not be financially disadvantaged if it provides refunds to collocators upon their vacation of the space" (id. at 217).

In summary, the CLEC Coalition asks the Department to dismiss Space Conditioning charges altogether. In the alternative, the CLEC Coalition recommends the Department require Verizon to: (1) recalculate the space conditioning cost study to include situations where no conditioning activity occurs as a result of the number of pre-conditioned, vacated spaces available in Verizon's COs; (2) eliminate space conditioning charges for SCOPE/CCOE collocation arrangements because these arrangements should occupy already conditioned space; (3) change the means of recovery to recurring rather than nonrecurring because the up-front costs pose a barrier to entry; and (4) issue a refund, rather than a credit, for a pro-rated portion of the space conditioning charge when a CLEC vacates its arrangement.

3. Analysis and Findings

First, the Department accepts Verizon's explanation that the reimbursement for reuse addresses the CLEC Coalition's issues of invalid sampling because only one conditioning cost will be attached to the space regardless of how many CLECs occupy that space (Verizon Reply Brief at 237 n.222). While the charge is based only on a sample of space requiring conditioning, CLECs are assured of not overpaying (and conversely of Verizon not over-recovering) by application of the reuse reimbursement mechanism (i.e., the refund to vacating CLECs) and by the fact that Verizon applies only one full conditioning cost to each space.

Second, the FCC has identified an ILEC's right to recover the costs incurred to condition space for SCOPE and CCOE arrangements. More precisely, with respect to SCOPE, the FCC stated "the incumbent must prorate the charge for site conditioning and preparation undertaken by the incumbent to construct the shared collocation cage or condition the space for collocation use, regardless of how many carriers actually collocate in that cage."

Advanced Services Order at ¶ 41. The FCC further stated that "if an incumbent implements cageless collocation arrangements in a particular central office that requires air conditioning and power upgrades, the incumbent may not require the first collocating party to pay the entire cost of site preparation." Id. at ¶ 51. Therefore, the Department finds the CLEC Coalition's argument regarding the space conditioning costs imposed on SCOPE/CCOE arrangements to be without merit.

We next address the issue of cost recovery for space conditioning on a recurring basis. While the CLEC Coalition correctly cites to the relevant section of the FCC's Local Competition Order, the Department finds that the CLEC Coalition misinterprets that passage. The FCC did not intend for nonrecurring charges to be recovered on a recurring basis indefinitely, which is why the FCC specified that NRCs could be recovered through recurring charges "over a reasonable period of time." Moreover, in the Phase 4-G Order at 26, the Department approved an amortized installed payment option that would "offer[ ] a low-risk way to enhance competition in the state by reducing a potential barrier to entry." Thus, CLECs already have the option to pay NRCs through what is, in effect, a recurring rate over a reasonable period of time. The terms of this payment option are specified in Tariff No. 17, Part A, Section 4.2.1. Therefore, the Department does not accept the CLEC Coalition's suggestion.

Finally, concerning the issue of reimbursement for vacating CLECs, we note that the Department adopted a credit for vacating collocators upon subsequent reuse of collocation space in the Consolidated Arbitrations proceeding. Verizon contends that this credit ensures no over-recovery of space conditioning costs because "the incoming CLEC would be responsible for [only] the remaining unamortized amount of the space conditioning charge" (RR-DTE-38). In addition, Verizon explains that it will not impose any additional charge on a subsequent collocator for additional space conditioning that may occur if that CLEC occupies previously conditioned vacated space (Verizon Reply Brief at 237 n.222).

The Department agrees with Verizon that it should not have to bear the financial risk associated with CLECs' vacating collocation space by issuing a refund without guarantee that a subsequent CLEC will occupy that space. In the Phase 4-G Order at 27, the Department found the "concept of a reuse credit as a fair reallocation of costs from a subsequent user." However, the CLEC Coalition presents a persuasive argument that a credit does not compensate a carrier that exits the market. The FCC has determined that state commissions have the responsibility to ensure that ILECs do not over-recover NRCs and that these costs are equitably allocated among all carriers utilizing that asset. Local Competition Order at ¶¶ 750-751. When Verizon issues a credit to a CLEC exiting the market, the credit will go unused and Verizon would be over-recovering costs. Because Verizon will be compensated for the pro-rated unamortized space conditioning charge from the subsequent collocator, the Department finds that the existing credit mechanism could lead to over-recovery by Verizon, and overpayment by CLECs exiting the market. Therefore, we direct Verizon to replace the credit mechanism with a monetary refund to a vacating CLEC upon subsequent occupation of that space. But, Verizon is not required to refund money to CLECs vacating the market when a balance is owed to Verizon. In that situation, upon subsequent occupation of collocation space, the money that would have been refunded by Verizon will be issued as a credit to the CLEC's outstanding balance (or account).

For the above reasons, the Department approves Verizon's Space Conditioning cost study with the required modifications.

E. Direct Current Power Consumption

1. Overview

The DC Power Consumption charge is a recurring charge that seeks to recover, on a per amp basis, the costs associated with the DC power plant components used to provide power to the CLECs' collocated equipment. This includes costs for engineering and installation of batteries, the microprocessor plant, rectifiers, automatic breakers, the power distribution service cabinet, the emergency engine, and the battery distribution fuse bay.

Verizon calculated the unit investment per amp for each item associated with the power plant as follows: (material investment) ÷ (amp capacity, per string, per unit, or per breaker). Individual unit investments were added together to determine the total unit investment per amp, to which the standard loading factors were applied. The costs for provisioning power greater than 60 amps and less than or equal to 60 amps were developed separately by density zone, and then weighted and averaged to yield a per amp rate.

AT&T raises issue with the following DC Power Consumption cost study inputs and recovery methodology: (1) the Power Installation factor; (2) the Digital Switch ACF; (3) the Emergency Engine capacity; (4) the weighted averaging of the rate; and (5) the application of this rate element when no power is consumed.

2. Power Installation Factor

a. Overview

Verizon proposes to apply a Power Installation Factor of 2.7852 to the Power Consumption cost study to recover the costs to engineer and install its CO power plants. The Power Installation factor is the ratio of investments associated with material assets and the installation-related costs to material investments alone (Exh. VZ-29, at 31). Verizon calculates a regional Power Installation factor based on its DCPR database, which stores the material and installed investments for power plant jobs from the year 1998.

b. Positions of the Parties

i. Verizon

As a general matter, Verizon argues that its DC Power Consumption costs "are based on a comprehensive and well-documented cost study and follow standard accounting and costing methodologies" (Verizon Brief at 254). In addition, Verizon states that its proposed power costs are consistent with the power rates previously approved by the Department and are in line with what other states have approved.

Contrary to AT&T's argument regarding the calculation of the DC Power Installation factor, Verizon states that its factor is calculated appropriately using data contained in its DCPR database. Verizon contends that in some instances using vendor invoices to determine costs is appropriate, but for the calculation of the installation factor "the information contained in DCPR . . . ensures that the installation charge applied will be predictable, rather than dependent upon the variations in any single job" (Verizon Reply Brief at 223). In addition, Verizon points out that the information contained in the DCPR database is based on actual invoices entered into its system and is a cross-representation of the different types of power jobs Verizon conducts.

Verizon contends that AT&T misunderstands the DCPR data because the database contains miscellaneous material costs as a subset of the total installation cost. According to Verizon, miscellaneous material costs are the costs of materials needed to install the power plant itself, such as nuts, bolts, and cable racking, and thus are an element of the installation cost. These miscellaneous costs, according to Verizon, are proportionally spread across the material components for a single CO within the DCPR database, and it would not be "appropriate to take from the DCPR database, as AT&T does, one entry for one power plant component . . . and compare it to the costs for the same component installed in another central office" (id. at 224). This, Verizon states, explains the inconsistencies in installed costs that AT&T cites.

In addition, Verizon claims that AT&T attempts to calculate an installation factor that "treats all material investments as part of material costs and not installation costs, even if the material in question is related solely to installation" and then seeks to apply that factor to Verizon's cost study, which defines material costs and installed costs differently than AT&T (Verizon Brief at 256) (emphasis in original). According to Verizon, AT&T's "mismatched methodology results in an understatement of the installation factor, and should be flatly rejected" (id. at 257).

Furthermore, Verizon argues that neither AT&T nor the CLEC Coalition demonstrates that economies of scale would be attained with the installation of large power jobs and the "failure to support their bald claim with any evidence renders their arguments valueless"

(Verizon Reply Brief at 226). Verizon points out that some of the large power jobs contained within its DCPR database show a higher installation factor than some of the small power jobs and vice versa. According to Verizon, this "demonstrates unequivocally that larger power plant installation jobs do not necessarily have a lower installation factor than small jobs" (id. at 227). Verizon is not surprised by this because, it notes, "each power plant project is unique and bears its own unique installation related costs" (id.). Verizon insists that the DCPR data used to calculate its Power Installation factor is a good representation of the installed investment, and in fact could be "understated" because it may not be representative of the miscellaneous material costs necessary to install a comprehensive power plant (id. at 228). However, if the Department were to require that the installation factor be derived from actual invoices, then Verizon requests to "have the opportunity to provide Massachusetts-specific invoices upon which to base that factor" (id. at 225).

ii. AT&T[150]

In general, AT&T states that the DCPR data Verizon uses to calculate its DC Power Installation factor "grossly overstates installation costs" (AT&T Reply Brief at 137). First, AT&T argues that the Power Installation factor should be representative of the relationship between material and installation costs of the power plant depicted in Verizon's DC Power Consumption cost study. By adding up the material costs in Verizon's DC Power Consumption cost study for a 6,000-amp power plant and comparing it to the average material investment per CO in the DCPR data, AT&T shows that the material investment for the power

150 The CLEC Coalition supports AT&T's argument against Verizon's calculation of its DC Power Installation Factor (see CLEC Coalition Brief at 192).

plant in Verizon's cost study is significantly greater than what Verizon uses to determine its Power Installation factor (AT&T Brief at 213). AT&T argues that this is a "strong indicator that there is in fact a mismatch between the material in DCPR data and the material in Verizon's cost study" (AT&T Reply Brief at 140). In fact, AT&T notes that if the installation factor it proposes is applied to Verizon's cost study, the in-place investment would be similar to what is found in Verizon's DCPR database. According to AT&T, Verizon's mismatching of data demonstrates that the data Verizon used to calculate its Power Installation factor are based on small augment jobs rather than data based on a comprehensive power plant installation.

Second, AT&T asserts that Verizon's proposed installation factor does not capture the economies of scale associated with comprehensive power jobs. AT&T supports this assertion by looking to the Department's findings in the Phase 4-G Order, where "the Department recognized the 'substantial efficiencies' in the construction of collocation cages that are 'subject to the economies of scale,'" and insists that "the same costing principle holds true for Verizon's power jobs" (AT&T Brief at 214). Rather than benefit from the economies of scale of comprehensive jobs, AT&T claims that Verizon calculates the higher installation cost of small augments and then applies this to more efficient comprehensive jobs, "thereby producing fantastically exaggerated installation costs for a properly sized power plant" (id.). In addition, AT&T insists that Verizon's reliance on small augment jobs to calculate its Power Installation factor violates TELRIC principles because it is not based on forward-looking "total demand."

Finally, AT&T states that Verizon's DCPR data are erroneous. To begin, AT&T notes that there are "rampant inconsistencies in the costs of installation" of 200-amp rectifiers contained within the data set, which results in inflated material installation costs (id. at 215-216). Although Verizon explains this as a "'spreading' of the miscellaneous items across the entire year that causes the 'dramatic difference' in the material cost versus the in-place cost," AT&T insists that one would then expect to see relatively consistent in-place material costs among Verizon's CO (id. at 216).

Instead, AT&T contends that actual vendor invoices provide more accurate installation costs. Invoices for the material and installation costs of a power plant from a competitive bidding process, according to AT&T, yield the best source for deriving a per amp cost. AT&T also notes that Verizon has validated the use of actual invoices: "These are actual costs that you can look at and determine that obviously the work that was performed in these various central offices over a period of time reflected the costs that Verizon actually incurs, and that's what we're trying to recover here" (id. at 218, citing Tr. 6, at 1026). In addition, AT&T argues that the use of actual invoices to determine the per DC amp cost would alleviate the issue of where miscellaneous material costs are placed in the calculation of the installation factor. Using actual Lucent invoices, AT&T calculated its own Power Installation factor from two DC power plant jobs in Pennsylvania and derived a factor of 1.454. AT&T claims that, "in addition to avoiding the problem of applying 'installation factors' to potentially ill-defined material costs, this method also permits the use of third party invoices for an entire plant that constitutes a discrete project, thus ensuring that all of the relevant costs are included and no irrelevant costs are 'allocated' to the project" (AT&T Reply Brief at 146). AT&T recommends the Department order Verizon to calculate its DC Power Consumption cost using AT&T's installation factor because it utilizes a methodology that is more precise and "that the

Department has espoused," and also brings DC Power costs more in line with what other states have accepted (AT&T Brief at 218).

c. Analysis and Findings

Verizon has chosen to develop its DC Power Consumption cost study based on a comprehensive power plant.[151] The Department finds this approach consistent with our assumptions under TELRIC.[152] However, Verizon's use of the DCPR database to derive its installation factor is inconsistent with this comprehensive approach.[153] The Department finds that Verizon's approach - deriving an installation factor from the costs associated with small, augment power jobs and applying that factor to the material investments of a comprehensive power plant to derive a per unit cost – is inappropriate. In theory, the per unit cost would be less for installing an entire power plant in one job than it would be for installing individual components separately. This theoretical approach incorporates the economies of scale that the FCC states should be shared by the ILECs with the CLECs.[154]

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151 A comprehensive power plant includes all the material components necessary to convert AC power into DC power and to ensure that power is maintained at standard operating levels in case the external power feed is cut off from the CO.

152 A comprehensive power plant is consistent with TELRIC in that going forward, Verizon would size its power plant based on its CO power requirements, which would include the necessary capacity to support CLEC equipment fully. This would require that each component of the power plant be sized with collocation in mind.

153 Verizon's DCPR database is populated with the costs for power plant augmentations performed throughout the Verizon-East footprint.

154 The FCC states that "incumbent LECs have economies of density, connectivity, and scale. . . . As we pointed out in our NPRM, the local competition provisions of the Act require that these economies be shared with entrants." Local Competition Order at ¶ 11.

By assuming the costs of an entire power plant, Verizon must also assume the installation of a similar plant in its calculation of an installation factor in order to capture the economies of scale that would result from such an installation. The Department agrees with AT&T that Verizon's failure to make these consistent assumptions results in a "mismatch" of methodologies and does not reflect the economies of scale associated with the installation of a complete power plant. Although Verizon argues that AT&T "has never provided any information that stated small-size jobs or augments cost any more than a large-size job to do" (Tr. 6, at 1045), TELRIC compels us to allow for the possibility of economies of scale by requiring that the installation factor be calculated from vendor invoices for the installed costs of an entire power plant. Therefore, we find that the data upon which Verizon's Power Installation factor is based are flawed and must be rejected.

AT&T presented the Department with two alternative installation factors, one (1.454) based on the comprehensive installations of two differently sized power plants (2400 and 3600 amps) in Pennsylvania, and the other (1.664) from a comprehensive power plant installation (1200 amps) in Massachusetts (see Exh. VZ-ATT/WC 1-90; Exh. DTE-ATT 1-4). In addition, AT&T submitted its vendor invoices for each power installation job to substantiate the material and installation costs in order to derive its Power Installation factor (see Exh. VZ-ATT/WC 1-90; Exh. DTE-ATT 1-4). Although the Department agrees with AT&T's approach in calculating the DC Power Installation factor using actual vendor invoices for the installation of a comprehensive power plant similar in size to what is being modeled in the DC Power Consumption cost study, its proposal has the following flaws: (1) AT&T calculates its factor using Verizon's emergency engine material investment, which does not include the costs for miscellaneous material; and (2) AT&T applies its own installation factor to derive the installed cost of that emergency engine (see Tr. 8, at 1499-1500). Thus, AT&T's approach results in an inaccurate installation factor.

In its Reply Brief, Verizon states that, "if the Department believes that actual jobs should be used to develop installation factors, then Verizon MA should have the opportunity to provide Massachusetts-specific invoices upon which to base that factor" (Verizon Reply Brief at 225). Granting Verizon's request to recalculate its installation factor on actual invoices after the evidentiary phase has closed significantly limits the Department's ability to fully investigate such new material and also rewards Verizon for failing to adequately present its case. Moreover, it does not address the real issue in dispute. The primary issue here is not so much the use of actual invoices, but whether to base this factor on power plant augmentations or on comprehensive installations.

Throughout this proceeding, Verizon has insisted that the augmentation power jobs contained in the DCPR database "result[ ] in the most accurate possible reflection of the labor costs associated with installing various types of power plant equipment" (Exh. VZ-29, at 32). As established earlier in this section, Verizon should have based its power installation factor on its costs to engineer, furnish, and install a comprehensive power plant, not on its costs for power plant augmentations. Even if Verizon submitted invoices to substantiate its costs contained within the DCPR database, the Department would still take issue with the nature of the data itself because it is based on augmentations. Therefore, the Department denies Verizon's request. Without an acceptable Power Installation factor being proposed from either party, the Department is left with the task of determining what that factor should be.

As explained earlier, Verizon's data are unsuitable, while AT&T's methodology is flawed. The Department recognizes that the difference in how Verizon and AT&T account for the miscellaneous material costs and where these costs are placed in the formula has a significant impact on the calculation of the installation factor. Because it is Verizon's accounting principles that are used in this proceeding, we will accept Verizon's classification of miscellaneous material costs as part of the installed investment. However, it is AT&T's actual invoices for two comprehensive power plants that are similar in size to what Verizon models in its cost study that best supports the calculation of this factor.[155] Utilizing AT&T's data in Exh. VZ-ATT/WC 1-90 and Verizon's methodology from Exh. VZ-29, the Department calculates a Power Installation factor of 2.15.[156] Verizon is ordered to apply the Power Installation factor of 2.15 to its DC Power Consumption cost study.

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155 Because 88.1 percent of Verizon's power plants are sized between 2,400 and 3,600 amps (see Exh. VZ-28, Part CA, Workpaper 5.0, at 1), AT&T's Pennsylvania invoices are similarly sized to what Verizon models in its cost study. Ideally, we would prefer a larger sample size of comprehensive power plant installations to derive the Power Installation factor, but the Department finds that AT&T's invoiced data are representative of the installed costs for a majority of Verizon's CO power plants in Massachusetts.

156 The formula Verizon uses to calculate its Power Installation factor, and which we adopt, is shown in Exh. VZ-29, at 31: (material assets + engineering + installation + transport/storage + hauling & hoisting + miscellaneous investments) ÷ (material assets). For proprietary reasons, the certified calculation of this factor is part of the sealed record. Parties that have signed confidentiality agreements may review this document.

3. Digital Switch ACF

a. Overview

Verizon's application of the Digital Switch ACF to its Power Consumption cost study recovers the annual expenses Verizon expects to incur in providing DC power to collocators. Verizon applies the Digital Switch ACF because power plants are placed primarily to support digital switching equipment. The CLECs argue that Verizon's rationale for applying this particular ACF is erroneous because the annual costs for switching equipment are radically different from those for power plants. In addition, the CLECs assert that Verizon's CO power plants are supporting collocated circuit-based equipment, not switching equipment.

b. Positions of the Parties

i. Verizon

Verizon contends that its use of the Digital Switch ACF in the calculation of the DC Power cost is appropriate because "most power installations are associated with the digital switch installations and upgrades" (Verizon Brief at 261). Verizon points out that the CLEC Coalition recommends a 30 percent reduction in the Switch ACF, but cannot provide an explanation as to why or how this was determined. In addition, Verizon states that the CLEC Coalition attempts to persuade the Department that only two maintenance personnel are necessary to oversee 1600 power plants, which is far less than what is necessary to maintain digital switching equipment (id. at 262). But Verizon claims that the CLEC Coalition "was most certainly not providing the type of maintenance care Verizon MA demands with respect to it(s) power plants" and, thus, the Department cannot rely on this testimony (id.) (emphasis in original).

Verizon also contends that AT&T's statement that "maintenance work for power equipment is much lower than the maintenance work for switching" is unsupported (id., citing Exh. ATT-16, at 48). Contrary to AT&T's assertion that the Digital Circuit ACF be used because CLECs collocate digital circuit equipment, Verizon insists that it is the digital switch that is "the 'cost causer' of the power plant placement" and therefore is the most appropriate factor to use (id. at 261).

ii. AT&T

AT&T argues that use of the Digital Switch ACF because switches are the "cost causer" for power plant installations is erroneous. According to AT&T, Verizon's reasoning is incorrect because it is an attempt by Verizon "to shift the discussion from the more important and more relevant question of what consumes the vast majority of power in a collocation arrangement to what is the cost causer of power plant placement" (AT&T Reply Brief at 144). Circuit-based equipment utilizes the majority of power requirements in a collocation arrangement, according to AT&T, and Verizon agrees with this (id.). While AT&T would prefer that a specific power ACF be calculated, which it argues would be lower than the circuit ACF, the lack of such a factor leaves AT&T to recommend the use of the circuit ACF "because the circuit ACF is associated with the asset class being studied – circuit-based equipment" (AT&T Brief at 221).

iii. CLEC Coalition

The CLEC Coalition argues that the use of the Digital Switch ACF is "misplaced" in that "the factors that drive the ACF such as depreciation life and maintenance cost are much lower for power plants than for switching" (CLEC Coalition Brief at 191). To illustrate the differences between the two pieces of equipment, the CLEC Coalition states that:

> The central office switch requires constant monitoring by switch technicians – every minute of the day. The digital switch typically serves tens of thousands of customers, large numbers of interoffice trunks, provides dial tone on various types of access lines, terminates trunks from IXCs, CLECs and other LECs, may host a good number of remote switches, etc. The amount of oversight, monitoring and maintenance is obviously far more intense – and costly – than keeping an eye on, say, a room of batteries for power back-up [id. at 191].

The CLEC Coalition agrees with AT&T that a specific power ACF should be calculated, but in the absence of such a factor, recommends that the Department reduce the Switch ACF by 30 percent to reflect better the maintenance costs and depreciation life of power equipment.

c. Analysis and Findings

Although Verizon argues that digital switch equipment is the "cost-causer" for power plant installations, for TELRIC purposes the Department is interested only in the incremental costs that result from collocation. Verizon acknowledges that "[p]ower cost is input into our ledgers based on whatever equipment it is that the power will support" (Tr. 7, at 1204). While the power costs for Verizon's CO equipment are incurred to support its digital switching equipment, the Department finds that it is the CLEC's collocated equipment that causes incremental costs to Verizon. Indeed, Verizon acknowledges that the equipment in a collocation arrangement that uses the majority of power is circuit-based (see id. at 1203). Thus, we find that the CLECs' circuit-based equipment is the "cost-causer" for power plant installations. Without a specific power ACF available, the Department agrees with AT&T that the Digital Circuit ACF is the more appropriate factor to apply to the DC Power Consumption cost study based on Verizon's own accounting rationale. Consequently, in its compliance filing, we direct Verizon to apply the Digital Circuit ACF to the DC Power Consumption cost study. Furthermore, for the next TELRIC rate proceeding, Verizon shall calculate a Power ACF for our review.

4. Emergency Engine

a. Overview

The emergency engine is the component of a power plant that provides the necessary AC and DC amps in the event that the external power feed is cut off from the CO. The issues here relate to the expression of the emergency engine amp capacity and the size of the representative emergency engine in Verizon's Power Consumption cost study.

b. Positions of the Parties

i. Verizon

Verizon disagrees with AT&T's argument that Verizon's emergency engine is undersized and states that AT&T's reasoning is based on "a false premise that Verizon MA's power study is expressed in DC amps, not AC amps" (Verizon Brief at 258). Verizon argues that its DC Power Consumption cost studies have been filed throughout New England, and in New York, Pennsylvania, and Delaware based on an emergency engine sized in AC amps, and that this is consistent with industry practice in that emergency engines only produce AC power. Moreover, Verizon states that "the comparison of DC amp needs and AC amp capacity is far from a one-to-one comparison" (id. at 259).

Additionally, Verizon notes that, on the one hand, AT&T argues that the emergency engine is undersized; yet, on the other hand, AT&T also argues that the emergency engine is oversized to support telecommunications equipment. Contrary to AT&T's assertion that power plants primarily support telecommunications equipment, Verizon insists that in the event of a power failure, "it is absolutely vital to the continued functioning of the central office that the emergency engines provide AC power to [the environmental plant]" (Verizon Reply Brief at 232, citing RR-DTE-40) (emphasis in original). In fact, Verizon argues, AT&T's suggestion would result in "serious operational problems that would be service affecting" (id. at 233). Although approximately 70 percent of the emergency engine capacity goes toward producing AC amps to power environmental plant while the remaining 30 percent goes to the rectifiers to produce DC amps necessary to power telecommunications equipment, Verizon contends that the size of the CO determines the emergency engine capacity allocation between environmental plant and telecommunications equipment. Regardless of the actual ratio, Verizon argues that given the large percentage of the capacity devoted to producing AC amps, "it would not even make sense to express the emergency engine capacity in DC amps" (Verizon Brief at 259). In addition, Verizon asserts that expressing the emergency engine capacity in terms of DC amperage would present the inaccurate assumption that AC amps were automatically converted into DC amps. Accordingly, Verizon recommends that the Department reject AT&T's claim.

ii. AT&T

AT&T is adamant that Verizon overstated its cost per DC amp by undersizing the amp capacity of its emergency engine. AT&T draws this conclusion from the fact that Verizon's initial DC Power Consumption cost study calculates a unit cost per amp for the different elements of a power plant and then totals these elements to derive a cost per DC amp (see Exh. VZ-29, Part CA, Workpaper 5.0, at 1). With the capacity for each piece of equipment expressed in DC amps, AT&T concludes that the emergency engine sizes "were insufficient to provide the necessary power for the power plant" (AT&T Brief at 223).

Verizon's insistence that the emergency engine be expressed in AC amps, AT&T argues, results in an incorrectly calculated cost study. According to AT&T, in order for Verizon to derive a per DC amp cost, each element must be expressed in DC amps, which would be consistent with the other elements that are summed together. AT&T points out that Verizon continues "to maintain that a cost study can combine a dollar per DC amp with a dollar per AC amp to arrive at the cost per DC amp," even though AC amps do not equal DC amps (AT&T Reply Brief at 151). According to AT&T, Verizon demonstrates in its response to RR-DTE-40 how to convert AC amps to DC amps utilizing kilowatt to AC amp and kilowatt to DC amp formulae. Therefore, AT&T concludes that Verizon can express the emergency engine capacity in DC amperage.

In addition, AT&T contends that Verizon's response to RR-DTE-40, which corrected its cost study to express the emergency engine capacity in DC amps, shows that the emergency engine is oversized. First, according to AT&T, Verizon sized the emergency engine under the assumption that it would be primarily supporting ancillary equipment (i.e., HVAC and lighting) and that only 30 percent of the emergency engine capacity would be devoted to telecommunications equipment. Yet, AT&T states that this is a faulty assumption in that the emergency engine is placed primarily to support the telecommunications equipment, and the emergency engine itself should be based on the size of the microprocessor. According to AT&T, "telecommunications equipment generally represents approximately 80 percent of the use of the backup generator" and, therefore, Verizon has oversized the emergency engine resulting in an overestimated cost per DC amp (AT&T Brief at 224-225).

Second, AT&T argues that Verizon calculates its per DC amp cost utilizing the entire investment of the emergency engine but with only the 30 percent capacity Verizon claims is devoted to supporting telecommunications equipment needing DC amperage. This, says AT&T, further results in an inflated cost per amp. AT&T states that applying the full capacity of the emergency engine, expressed in DC amps, to the entire investment will result in a DC cost per amp of $5.39 (id., Addendum at 2). AT&T points out that this rate is more in line with what the New Hampshire PSC approved as an acceptable rate for DC power.

Third, AT&T argues that Verizon's proposal to recover both a per DC amp and per AC amp rate would result in double-recovery.[157] By comparing the initial DC Power Consumption cost study filed in May 2001 with Verizon's revised workpapers filed in response to RR-DTE-40, AT&T notes that Verizon has utilized the full investment of the emergency engine in both the revised AC and DC workpapers. According to AT&T, this results in the full cost recovery of the emergency engine through the DC rate element, and recovery of "71 percent of the same backup generator again through this new AC power rate element (for metro offices)" (id. at 227).

According to AT&T, Verizon's "incorrect use of AC amperages in its DC cost study is only intended to overstate the cost for DC power to collocators" (id. at 228). In addition, AT&T asserts that while Verizon's revised workpapers correctly calculate the emergency

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157 Verizon's AC Amp cost study recaptures a portion of the emergency engine investment that supports the ancillary equipment in the event of a power outage.

engine unit investment based on DC amps, they still contain flaws. Therefore, AT&T recommends that the Department approve AT&T's DC Power Consumption cost study filed as an attachment to its Initial Brief (id., Addendum at 2).

c. Analysis and Findings

First we address the methodology. Although Verizon maintains that emergency engines do not produce DC amps but rather AC amps only, the Department agrees with AT&T that a properly constructed cost study must be based on a consistent methodology (AT&T Brief at 223). Verizon's use of AC amps for the emergency engine capacity results in a unit cost per AC amp, even though its DC Power Consumption cost study seeks to derive a cost per DC amp that will be assessed to the CLECs based on their DC power requirements. Although Verizon argues that "one cannot simply substitute the DC and AC amp figures as Mr. Turner [on behalf of AT&T] seeks to do" (Verizon Brief at 259), this is exactly what Verizon has done by calculating a unit cost per AC amp within a DC amp cost study. Thus, we find that Verizon must redo its DC Power Consumption cost study using emergency engine capacity expressed in DC amps.

However, the Department agrees with Verizon that the entire capacity of the emergency engine cannot be expressed solely in DC amps. To do so would result in an under-recovery of its material investment. Verizon's DC Power Consumption cost study seeks to recover its incremental costs resulting from CLECs' placement of telecommunications equipment in collocation areas. The Department agrees with Verizon's proposal of breaking out the costs in relation to both the AC and DC amp allocation in order to ensure proper cost recovery. Nevertheless, even though Verizon can identify its incremental power costs specific to CLECs based on the DC amp requirements listed on their collocation application, the AC amp capacity devoted to Verizon's environmental equipment cannot be attributed directly to the CLECs' telecommunications equipment. In the Phase 4-G Order, the Department noted that the DC Power cost study "is distinguished from the power that would be used for lighting, ventilation, and other building functions in the central office structure in which the collocation cage is located, which is recovered in the recurring charge for use of floor space in the building." Phase 4-G Order at 17, n.3. Consistent with our findings in the Phase 4-G Order that incremental costs associated with ancillary equipment be recovered through Verizon's Building Expense charge, we conclude that the material investment of the emergency engine that is related to environmental support should also be recovered through the Building Expense charge. Therefore, Verizon's per AC amp cost study filed in response to RR-DTE-40 is denied.

Next, we address the allocation of the emergency engine's capacity to telecommunications equipment. Verizon persuasively argues that, "were the AC power not provided to the environmental plant, the central office would not be cooled . . . and the system would rapidly overheat and shut down" (RR-DTE-40). Verizon argues that approximately 30 percent of the emergency engine's capacity should be allocated to support telecommunications equipment whereas AT&T argues that the appropriate allocation is approximately 80 percent (RR-DTE-40; AT&T Brief at 224-225).

AT&T did not provide documentation to support the validity of its claim. Verizon, however, submitted invoices of its material investments in Exh. ATT-VZ 5-4. Upon review of the invoices submitted by Verizon,[158] the Department finds that the sizing of the emergency engines in the Urban and Suburban density zones in Verizon's DC Power Consumption cost study is fully supported. In addition, the Department affirms Verizon's sizing of its emergency engine in the Metro density zone under its premise that "larger central offices contain much more heat-generating equipment in a much larger, but more densely occupied space. Much more HVAC, therefore, is necessary to keep this massive plant sufficiently cool to function" (RR-DTE-40, at 3, n.8). Consistent with this premise, the reverse holds true for Verizon's rural COs in that smaller, less densely packed space would require less HVAC, and therefore, require a much smaller emergency engine. Thus, we find Verizon's sizing of the emergency engine for its rural COs reasonable. Verizon used these corresponding emergency engine sizes in its kilowatt-to-AC and kilowatt-to-DC conversions and subsequent capacity allocation worksheets submitted to the Department (see RR-DTE-40, Att. 1, Workpapers 3.0, 4.0, 5.0). Verizon substantiated its claim that approximately 30 percent of the emergency engine's capacity is dedicated to telecommunications equipment in a Metro CO and that, as the COs get smaller, more capacity is dedicated to the telecommunications plant. Therefore, the Department agrees with Verizon's emergency engine capacity percent allocation as calculated in RR-DTE-40, Att. 1, Workpaper 3.0.

Verizon must recalculate its DC Power Consumption cost study using an emergency engine amp capacity expressed in DC amps. The DC amp capacity and material investment of

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158 The Department concludes, and all parties agree, that vendor invoices are the most reliable evidence to determine the actual material investments incurred by Verizon. Furthermore, the Department notes that in some instances, vendor invoices can further corroborate Verizon's actual engineering practices.

the emergency engine shall reflect the percent of capacity allocated to telecommunications equipment for each density zone as shown in RR-DTE-40. For example, the emergency engine located in the Metro density zone would have a material investment of $25,143.00 ($86,700 x 29 percent).[159] To derive the unit investment per DC amp in the Metro region, the apportioned material investment of $25,143.00 plus the material investment of conduit and emergency lights ($35,000)[160] would be divided by the utilized DC amps, which is 4,200 (6,000 x 70 percent), resulting in a unit investment per amp of $14.32 ($60,143 ÷ 4,200). Verizon shall utilize this process to determine the unit cost per DC amp for each of the four density zones in its compliance filing. Verizon shall submit costs deaveraged among four zones and shall also submit costs deaveraged among three zones (i.e., with the Metro and Urban zones combined).

5. Deaveraged Rates

a. Overview

Currently, Verizon charges for DC Power Consumption in Tariff No. 17 on a deaveraged basis, establishing different power rates for the four density zones in Massachusetts. In this proceeding, Verizon utilizes a statewide weighting factor that it applies to the Power Consumption cost study to develop one statewide power rate. The CLEC Coalition argues that the rates should continue to be deaveraged.

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159 These amounts are included for illustrative purposes; the actual amounts may differ depending on other directives in this Order.

160 The Department allows the calculation of the emergency lighting to remain in the Power Consumption cost study because it is powered with DC amps. See RR-DTE-37, Att. 3, at 9.

b. Positions of the Parties

i. Verizon

Verizon proposes its DC Power Consumption rate element on an averaged basis to "ensure[ ] consistency with how the other central office UNE rate elements are offered and provide[ ] consistency for billing purposes" (Exh. VZ-29, at 48-49). In addition, Verizon states that the decision to average its rates was not for simplicity but rather because it is "how Verizon feels it best recovers their costs" (Tr. 6, at 1121).

ii. CLEC Coalition

The CLEC Coalition contends that "there is a significant variation in the cost components of the Power Consumption charges across the four [density] zones" ranging from $19.10 to $33.75 per DC amp (CLEC Coalition Brief at 190). Citing the FCC, the CLEC Coalition points out that "state commissions shall establish different rates for elements in at least three defined geographic areas within the state to reflect geographic cost differences" (id., citing 47 C.F.R. § 51.507(f)). The CLEC Coalition notes that the New Hampshire PSC required Verizon-NH to deaverage its power costs. By not deaveraging the power rates, the CLEC Coalition contends that "the benefits of deaveraged loop rates will be mitigated by the averaged power consumption costs necessary to access those loops" (id. at 190). According to the CLEC Coalition, because "each central office is clearly in one zone or another, it would be no harder to deaverage Power Consumption charges as it is to deaverage loop charges," and therefore it recommends that the Department require the DC Power Consumption rates be deaveraged (id. at 190-191).

c. Analysis and Findings

The FCC states that "deaveraged rates more closely reflect the actual costs of providing interconnection and unbundled elements." Local Competition Order at ¶ 764. Here, the record demonstrates that the costs for DC Power Consumption significantly vary across the four designated density zones in Massachusetts (see RR-DTE-39, Att.). And, when a state finds significant cost differences across density zones, FCC rules require deaveraging. Other considerations, such as administrative consistency, are not permissible factors for us to take into account. Therefore, the Department orders Verizon to deaverage its Power Consumption cost study when it submits its compliance filing. Verizon shall submit costs deaveraged among four zones and shall also submit costs deaveraged among three zones (i.e., with the Metro and Urban zones consolidated).

6. Unbundled DC Power

a. Overview

Verizon proposes two separate rate elements for DC power to allow for CLECs to order drained amps and fused amps.[161] The CLECs argue that Verizon's assessment of the Power Consumption rate element immediately upon CLECs' occupying collocation space contradicts the premise of ordering drained amps.

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[161] Drained amps are the amps requested by the CLEC in its collocation application necessary to power its telecommunications equipment. This allows the CLECs to pay only for the amps actually consumed. Fused amps are recovered in the Power Distribution charge and are typically measured at 1.5 to 2.5 times the requested drained amps in order to prevent circuit overload. See Section IX.F (DC Power Distribution).

b. Positions of the Parties

i. Verizon

Verizon points out that the CLEC Coalition does not want to pay for DC Power Consumption charges once the collocation space is turned over to them, and Verizon argues that this "is nothing more than an attempt to shift costs to Verizon MA while the CLECs decide whether and when to start providing services to end users" (Verizon Brief at 263). Verizon maintains that it makes substantial up-front investments in order to accommodate collocation. Verizon notes that the CLECs cause the costs of these investments. Because Verizon has no control over when a CLEC decides to offer services and would not have otherwise made these power plant investments, Verizon argues it should not be required to absorb these costs while the CLEC ponders its business plan.

ii. CLEC Coalition

Although Verizon intends the DC Power Consumption cost study to charge collocators for drained amps, the CLEC Coalition contends that the cost study "belies this notion" because the study does not measure the actual DC amps consumed by collocators. The CLEC Coalition contends that, "under TELRIC cost causation principles, CLECs should only be charged for power consumption based on the actual amount of power consumed" (CLEC Coalition Brief at 189). According to the CLEC Coalition, there are times when CLECs are not offering services from their collocation spaces, such as during ramp-up periods or due to regulatory struggles, and during this time, they argue, "it would not be appropriate to assess collocators any Power Consumption charges" because no power is actually being drained (id.).

Because CLECs order DC power based on drained amps, the CLEC Coalition insists that collocators should not be charged for power that is not consumed.

c. Analysis and Findings

The Department agrees with Verizon that it is entitled to begin recovering its costs for providing DC power to the collocation arrangement as soon as that arrangement is turned over to the CLEC. On a collocation application, CLECs specify the amperage required to support their telecommunications equipment placed within that collocation space. In processing these applications, Verizon engineers must assess whether the existing power plant has the capacity to support the CLEC-requested DC amps and, as Verizon states, "if we needed additional batteries and rectifiers, if we needed additional [Battery Distribution Fuse Bays], we would augment that power plant to provide that, based on the requirements that either ourselves or the collocators had" (Tr. 7, at 1210-1211). In these instances, Verizon will be incurring up-front costs to accommodate CLEC equipment.

In addition, the Department has permitted Verizon to recover its power costs upon turning collocation space over to a CLEC. See Tariff No. 17, Part E, Section 2.4.1.D. Although Verizon is now proposing power rates based on "drained" amps rather than "load" amps, the Department disagrees with the CLEC Coalition that this requires Verizon's Power Consumption rate element to be applied only when CLECs actually consume power (CLEC Coalition Brief at 189). Even though a CLEC may not have placed equipment in its collocation space, Verizon incurs costs by having that space reserved and is therefore justified in charging the Building Expense rate once it turns over that space to a CLEC. Similar to the application of the Building Expense rate element, Verizon's Power Consumption rate element should be assessed upon immediate occupation because Verizon reserves a portion of its DC amp capacity in response to a CLEC's collocation application. By recovering the Power Consumption charge once space is turned over, the cost structure will create an incentive for CLECs to be prudent in seeking to collocate, which will reduce the likelihood of Verizon incurring up-front investments that may go unused and unnecessarily exhausting CO space. Therefore, because Verizon incurs up-front costs in the form of power plant augmentations or capacity allocation, the Department denies the CLEC Coalition's request.

F. DC Power Distribution

1. Overview

The DC Power Distribution charge seeks to recover the costs associated with the cable investment from the Battery Distribution Fuse Bay ("BDFB")[162] to the collocation area. The gauge of cable needed to power the CLECs' telecommunications equipment is based on the distance from the BDFB and on the fused amps necessary to prevent circuit overload. Verizon used cost data from 70 percent of the collocation jobs performed in year 2000 to develop the charge, and calculated the average length per gauge per density zone. This information was weighted to derive a statewide average length per gauge and then multiplied by the cost per foot for that gauge. To this, Verizon applied the Switch EF&I, Switch ACF, and Land, Building, Common Overhead, and Gross Revenue Loading factors to compute the cost per gauge. Verizon multiplied this cost by the number of cable placements per gauge in the

[162] BDFBs are secondary, multi-load distribution bays, fed from a power plant, and provide capability to distribute DC power to secondary equipment. Typically, DC power requirements less than or equal to 60 amps are fed from the BDFB. DC Power requirements greater than 60 amps are fed directly from the power plant.

sample for each fuse group, added the costs per fuse group, and then divided this sum by the total number of cables placed for each fuse group to derive the cost per cable fused.

As opposed to Verizon's existing power charges where CLECs pay for DC Power Consumption and Distribution as a bundled charge (i.e., a single rate per amp, per density zone), in this case, Verizon has proposed separate state-averaged charges for DC Power Consumption and Power Distribution to allow CLECs to order the amperage required for their equipment separately from the fused amps required for the distribution cabling. The CLECs argue that Verizon's COs are not efficiently designed, which results in excessive power distribution cable lengths, and that Verizon has applied improper loading factors to its cost study.

2. Positions of the Parties

a. Verizon

Verizon maintains its Power Distribution cost study "provides a sound estimate of the costs that [it] is experiencing, and expects to experience going forward, in providing DC power to CLECs' equipment" (Verizon Brief at 262). Although AT&T and the CLEC Coalition both argue that Verizon's cable lengths do not comply with TELRIC, Verizon explains that these lengths "result from realities of the landscape and the engineering realities of the actual central office – whose location is assumed not to change under TELRIC" (id. at 263). Verizon further points out that it conducted an extensive study of 70 percent of the collocation distribution jobs for year 2000 to arrive at the cable lengths included in its cost study.

b. AT&T

AT&T maintains that Verizon's Power Distribution cable lengths are excessive. AT&T insists that its own engineering experience has resulted in a one-way cable length of 45 feet. Looking to a decision by the Texas Public Utilities Commission ("Texas PUC"),[163] AT&T argues that a distance of 55 feet between the collocation arrangement and the BDFB is a more appropriate cable length than Verizon's proposal.

In addition, AT&T contends that Verizon itself cannot determine the appropriate cable lengths. AT&T shows that Verizon's supporting documentation calculates the average one-way cable length for the metro density zone to be 121 feet (see Exh. ATT-VZ 5-12). However, AT&T points out that Verizon filed testimony "stating that this 121 feet should be halved again to arrive at 60.5 feet" and testified at the hearings to this same effect (AT&T Brief at 229-230). According to AT&T, this inconsistency is a result of Verizon's "effort to demonstrate that [its] assumed cable length is about the same as the cable length utilized by the Texas PUC (55 feet), thus demonstrating that even Verizon concedes its assumed 121 foot cable is far too long" (id. at 230). For this reason, AT&T recommends the Department require Verizon to utilize the same 55-foot cable length approved by the Texas PUC.

c. CLEC Coalition

The CLEC Coalition argues that Verizon's power distribution cable lengths should "correspond to a TELRIC configuration of the central office" (CLEC Coalition Brief at 194). According to the CLEC Coalition, Verizon's approach to determining the cable lengths

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[163] Proceeding to Establish Permanent Rates for Southwestern Bell Telephone Company's Revised Physical and Virtual Collocation Tariffs, Texas Public Utilities Commission Docket No. 21333, Revised Arbitration Award, at 70 (April 12, 2001).

between the power source and the collocation arrangement is based on embedded inefficiencies. The CLEC Coalition claims that no studies were conducted to determine if Verizon's COs were configured according to TELRIC, and that with Verizon's ability to determine the placement of collocation arrangements, "it is, so to speak, putting the fox in charge of the henhouse" (id., citing Exh. CC-3, at 118). According to the CLEC Coalition, this results in a wide disparity among the various cable lengths due to historic and embedded inefficiencies within Verizon's COs.

As the CLEC Coalition notes, some of Verizon's COs were built decades ago and were designed for a different type of network. For this reason, the CLEC Coalition argues that "these central offices are far from the least cost, forward-looking networks required by TELRIC" (id. at 195). Looking to the FCC's Local Competition Order, the CLEC Coalition interprets TELRIC with respect to COs as finding that "only the existing locations of the central offices should be included in the study; the design of the central offices themselves should be least cost, forward-looking" (id.). The CLEC Coalition notes that this interpretation is consistent with the Michigan PSC's findings[164] in which efficient configurations are the basis for collocation rates.

In addition, the CLEC Coalition contends that Verizon failed to consider different types of collocation arrangements in determining the average distribution cable lengths. The CLEC

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[164] In the Matter, on the Commission's Own Motion, to Consider the Total Service Long-Run Incremental Costs ["TSLRIC"] for All Access, Toll, and Local Exchange Services Provided by Ameritech Michigan, Michigan Public Service Commission Case No. U-11831, Opinion and Order, at 30 (November 16, 1999). This Order found that "TSLRIC principles require the assumption that the location of the buildings remains unchanged, but does not require the assumption that the existing buildings with their current configuration will be used." Id.

Coalition contends that SCOPE/CCOE arrangements are more adaptable to placement within Verizon's COs and allow for collocated equipment to be located more closely to power sources in order to minimize the lengths of the cable runs. The failure to include such arrangements in Verizon's study, according to the CLEC Coalition, results in above average power distribution lengths. To correct these problems, the CLEC Coalition recommends the Department order Verizon "to use only those collocation jobs that occurred in central offices that have average or shorter than average lengths" (id. at 196, citing Exh. CC-3, at 122-123) (emphasis in original).

Not only does the CLEC Coalition argue that Verizon's average cable lengths are not TELRIC compliant, but also that it has inappropriately applied the Land, Building, and Digital Switch factors to its cost study. The CLEC Coalition claims that the application of the Land and Building factors assumes that these cables occupy valuable CO space, when in fact these cables do not. Not only does the CLEC Coalition observe that power cables are placed in overhead racks, but the CLEC Coalition also notes that "land and building costs are already recouped through the Land and Building factors being applied against all pieces of equipment housed in the central office including the power plant itself" (id. at 198).

The CLEC Coalition argues that the application of the Digital Switch ACF "accounts for approximately 85 percent of the costs" (id., citing Exh. CC-3, at 125-126). Compared to the relatively simple installation and minimal maintenance of power cables, the CLEC Coalition argues that digital switches are more complex pieces of equipment to install, monitor and maintain. In support of its claim, the CLEC Coalition looks to a New Hampshire PSC decision, which found that the installation costs for power cables and associated racking are not more than those for digital switch equipment installations.[165] The CLEC Coalition recommends that the Department remove the Land and Building factors from the Distribution cost study and reduce the Digital Switch ACF by 30 percent.

3. Analysis and Findings

In this section, the Department must determine an appropriate average power distribution cable length. AT&T does not present any specific evidence to support its recommendation of 45 feet, but merely points to a Texas PUC decision that adopted a cable length of 55 feet. AT&T's argument is not persuasive in that it relies solely on the outcome of a Texas decision, and, as we stated in Section III, above, we will not rely simply on the results found in other states.

Verizon, on the other hand, presented specific data of average distribution cable lengths. In Exh. ATT-VZ 5-12, Verizon provided data showing an average one-way distribution cable length of 121 feet for its metro COs. However, in both Tr. 6, at 1049-1050 and Exh. VZ-29, at 43, Verizon states that the 121 feet is for the total cable length and that it must be halved, in accordance with how the Power Distribution cost study is developed (see Exh. VZ-28, Part CA, Workpaper 5.0, at 2). Although Verizon's original data show an average one-way distribution cable length of 121 feet, in supplemental testimony and at hearings, Verizon testified that the average one-way distribution length is 60.5 feet, and that an average one-way cable distance of 60.5 feet for its metro COs is "quite reasonable" (Exh. VZ-

165 The CLEC Coalition provided an incorrect reference for this cite. The correct reference is Petition for Approval of Statement of Generally Available Terms Pursuant to the Telecommunications Act of 1996, New Hampshire Public Service Commission Docket No. DT 97-171, Order No. 23, 915, at 10 (February 4, 2002).

29, at 43). Therefore, the Department finds that the evidence supports a finding of an average distribution length of 60.5 feet.

In addition, the Department requires Verizon to apply the Digital Circuit ACF to its Distribution cost study. As we stated in the DC Power Consumption section of this Order, for TELRIC purposes the Department is interested only in the incremental costs that result from collocation, and as we determined earlier, telecommunications equipment that is placed in collocation areas is circuit-based. Therefore, it is not appropriate to apply a Digital Switch ACF when power distribution cables support circuit-based equipment.

However, the Department rejects the CLEC Coalition's argument regarding the application of the Land and Building factors based on our findings in the Phase 4-G Order. In that Order, Verizon argued that "those factors are used in the TELRIC methodology to reflect the relationship between plant-related services and the need for corresponding power and building investment." Phase 4-G Order at 22. The Department agreed, finding that these factors were consistent with TELRIC principles and were appropriately applied. Id. In the present case, the CLEC Coalition did not present any new arguments or evidence against the application of the Land and Building factors; therefore, we affirm our previous findings.

G. CCOE Security Costs

1. Overview

Verizon's CCOE Security cost study recovers the forward-looking costs Verizon expects to incur to equip its COs with security measures necessary to protect its network as a result of CCOE arrangements. Verizon developed the monthly recurring cost by dividing the security expenses incurred to provision CCOE by the forecasted square footage for CCOE, and then applying ACFs. The CLEC Coalition argues that the investments Verizon used are excessive and that Verizon should share the security costs.

2. Positions of the Parties

a. Verizon

Verizon states that it appropriately seeks to recover the costs for installing security measures in its COs and that its study is based on "actual expenses it has incurred in a sample of central offices in which the amount and types of security varied" (Verizon Brief at 253, citing Exh. VZ-28, at 37-38). Verizon notes that "the FCC has unequivocally ruled that Verizon MA is entitled to recover from the CLECs the costs it incurs to protect its network from dangers arising from collocation" (id. at 254, citing Exh. VZ-29, at 64 (citing Advanced Services Order at ¶ 48)).

Although the CLEC Coalition argues that Verizon's security rates are too high, Verizon points out that the CLEC Coalition's "claims were based on 'just . . . some impressions' rather than any meaningful study" (id. at 253, citing Tr. 7, at 1295). In addition, Verizon contends that the CLEC Coalition's recommendation that the ACF applied to the security cost study be reduced by 50 percent is based on "nothing more than speculation" (id.).

Furthermore, Verizon points out that the CLEC Coalition assumes Verizon's security costs include the costs of security cameras only. However, Verizon states its security costs include alternate forms of security measures. Verizon states the CLEC Coalition's "criticisms have no credibility and should be rejected" (id. at 254). Accordingly, Verizon recommends the Department approve its "well-documented security costs" (id.).

b. CLEC Coalition

The CLEC Coalition contends that Verizon's security charges are "gold plated" for what are essentially security cameras, and that these charges "would cost CLECs more than rent" (CLEC Coalition Brief at 223). To begin, the CLEC Coalition points out that Verizon has not apportioned any of the security costs onto itself, but instead, Verizon allocates the entire cost to cageless collocators. According to the CLEC Coalition, because cageless collocation arrangements are mixed in with the ILEC's equipment line-ups and because Verizon personnel and contractors have access to these COs, "the security systems benefit Verizon as much as the collocators" (id.). With both Verizon and collocators benefiting, the CLEC Coalition insists that the security costs should be apportioned to Verizon as well. The CLEC Coalition recommends that the Department apportion some of the security costs to Verizon based upon the proportion of CO square footage occupied.

The CLEC Coalition also argues that Verizon inappropriately applies the Digital Switch ACF to its cost study. According to the CLEC Coalition, the use of the Digital Switch ACF assumes that Verizon's security equipment needs maintenance and monitoring equivalent to that for digital switches. Yet, the CLEC Coalition contends that once security cameras are installed, little or no maintenance is required. With the application of the Digital Switch ACF, the CLEC Coalition argues that Verizon assumes that the security camera maintenance alone will cost approximately $14,500 each year. As the CLEC Coalition sees it, "this estimate does not pass the red-faced test" (id. at 224, citing Exh. CC-3, at 142). Therefore, the CLEC Coalition recommends that the Department reduce the switch ACF applied to the security cost study by 50 percent.

3. Analysis and Findings

The FCC has held that "the incumbent LEC may not impose discriminatory security requirements that result in increased collocation costs without the concomitant benefit of providing necessary protection of the incumbent LEC's equipment." Advanced Services Order at ¶ 47. In addition, the FCC recently affirmed that "[a]n incumbent LEC may require collocators to pay only for the least expensive, effective security option that is viable for the physical collocation space assigned." Collocation Remand Order at ¶ 103.[166] Consistent with the FCC's findings, the Department stated: "[w]e remain convinced that Verizon may not charge for duplicative security measures. We recognize that each central office, and even different areas within a single central office, are unique in terms of the type and level of security needed." Tariff No. 17 Order at 15 (emphasis in original). For the reasons outlined below, we refuse to apportion to Verizon any of the CCOE security costs, or to modify the ACF.

The Department agrees with Verizon that it should not be required to share a portion of these costs, because it "would not need these security measures if it were not required to provide cageless collocation" (Exh. VZ-29, at 65). The CLEC Coalition's proposal for Verizon to share in the costs of security and for the cost recovery to be apportioned based on square footage occupied would relinquish the CLECs from most security costs, resulting in Verizon bearing the principal burden. Furthermore, cageless collocation, which is

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166 In the Matter of Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket No. 98-147, Fourth Report and Order, FCC 01-204 (rel. August 8, 2001) ("Collocation Remand Order").

intermingled with Verizon's equipment, does not allow for physical separation of equipment, and there are relatively few alternatives Verizon can implement to ensure adequate protection of its network.[167]

Additionally, the CLEC Coalition is mistaken in its claims about Verizon's application of the Digital Switch ACF. The CCOE Security Charge Per Bay cost study applies the Digital Circuit Other ACF, not the Digital Switch ACF (see Exh. VZ-28, Part CC, Workpaper 3.0, at line 8). Therefore, the Department finds that Verizon's proposal to recover the costs for CCOE security on a per bay basis is reasonable.

H. Cost Recovery Transition Plan

1. Overview

Verizon's proposed collocation cost studies change the way CLECs are charged from a recurring cost structure for interconnection arrangements used to a nonrecurring cost structure for arrangements ordered. AT&T proposes having a cost recovery transition plan to minimize the financial impact of the implementation of Verizon's new cost structure, by providing a way for existing collocators operating under the current cost structure to move to the proposed structure. AT&T argues that the Department should ensure that a cost recovery transition plan, similar to what Verizon has implemented elsewhere, be adopted or else grandfather existing arrangements from the new pricing structure.

[167] The Department is currently reviewing collocation security issues in D.T.E. 02-8. The results of that investigation may affect Verizon's collocation security costs.

2. Positions of the Parties

a. Verizon

Verizon states that it intends to implement the transition plan agreed to by the CLECs in other jurisdictions. Although Verizon notes that "this transition plan places a substantial financial burden on [itself]," it insists that this "plan is more than fair to the CLECs" (Verizon Reply Brief at 241). Specifically, Verizon points out that unused cross-connects can be returned within 30 days of the rate structure being approved and that monthly recurring costs paid up to the date of transition will be applied to the new nonrecurring charge (id. at 240).

b. AT&T

AT&T notes that some of Verizon's proposed collocation rates will change the way Verizon charges for interconnection arrangements from a recurring cost structure to a nonrecurring cost structure. AT&T contends that CLECs will be forced to incur up-front costs not foreseen when they entered into agreements with Verizon, because under this new rate structure CLECs will be "liable for a large nonrecurring charge for the interconnection arrangements that they ordered in the past, but have yet to place into service" (AT&T Brief at 233). Additionally, AT&T points out that some CLECs have been paying recurring charges for certain network elements over a period of time, which Verizon will now seek to recover as a nonrecurring charge. According to AT&T, "[t]o the extent that Verizon has already been completely compensated, the nonrecurring charge that Verizon is now proposing would be wholly inappropriate" (id.).

In order to mitigate the impact this change in structure will have on CLECs with existing interconnection agreements, AT&T recommends the Department require Verizon to file a transition plan for collocators to move from the existing recurring cost structure to Verizon's proposed nonrecurring cost structure or else grandfather existing interconnection agreements. AT&T stresses that failure by the Department to require at least one of these approaches will leave Verizon with "too much discretion and could easily cause damage to collocators" (id. at 234).

3. Analysis and Findings

Verizon agreed to implement a CLEC-supported transition plan that is in place in other jurisdictions "that fairly allows CLECs to transition to the new rate structure" (Verizon Reply Brief at 240). Because AT&T "does not object in principle to the new rate structure" (AT&T Brief at 234), we believe the implementation of a reasonable transition plan adequately addresses AT&T's concerns. Therefore, the Department requires Verizon to submit this plan as part of its compliance filing for our review.

X. NONRECURRING COSTS

A. Introduction

NRCs are one-time costs associated with the process by which CLECs order particular UNEs from Verizon (the "service order" process) and by which Verizon actually installs and activates those UNEs (the "service provisioning" process) (Exh. VZ-14, at 4). Verizon submitted a NRC Model ("NRCM") in which it computes the costs of numerous service order and service provisioning items. AT&T, citing what it asserts are flaws in Verizon's NRCM, offers an alternative NRCM[168] and recommends many specific modifications to Verizon's

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[168] In their briefs, no party appears to advocate the use of AT&T's NRCM except in the context of proposing specific modifications to Verizon's NRCM. Accordingly, we will not address AT&T's NRCM in this Order.

NRCM. WorldCom and the CLEC Coalition also recommend specific adjustments to Verizon's NRCM. This is the first proceeding in which the Department is examining Verizon's recurring and nonrecurring UNE costs simultaneously. Verizon submitted its first set of wholesale NRCs in January 1998 as part of Phase 4 of the Department's Consolidated Arbitrations (Exh. VZ-14, at 2). The Department adopted Verizon's nonrecurring cost model, with modifications, in Phase 4-L and Phase 4-O of the Consolidated Arbitrations.

Verizon submitted a NRC study in May 2001, and submitted revisions to its NRC study in July 2001, December 2001, and January 2002. According to Verizon, the July revision was necessary because, in its original filing, Verizon "inadvertently applied a 25 percent forward-looking loop technology mix reduction to the central office wiring and provisioning costs for both stand-alone and platform new UNE loops" (Exh. VZ-16, at 2). Verizon indicates that the copper/UDLC/IDLC loop technology mix should be applied only to new UNE-Platform loops (Exh. VZ-16, at 2). In December, Verizon submitted revised costs based on new average work time data provided by Andersen Consulting (Exh. VZ-18, at 4). On January 16, 2002, Verizon provided revisions to its calculation of UNE-P NRCs "to apply basically the same level of left-in jumpers, sometimes referred to as dip [dedicated inside plant], that the company experiences in the retail business to the provisioning of new UNE-Ps, both initial and additional" (Tr. 3, at 436).

Verizon proposes several changes to the methodology it used to compute NRCs in its 1998 study. Verizon proposes to compute loop costs on a first-loop-per-order and additional-loop-per-order basis instead of computing costs based on a single order, an order of two to nine loops, and an order of ten or more loops. Verizon contends that this cost structure "better reflects the economies attained when orders are placed for more than one loop" (Exh. VZ-14, at 5). At present, Verizon computes a single, weighted average NRC loop cost based on hot cut (i.e., migration) and new loop costs, and, in this proceeding, Verizon proposes two distinct costs, one for hot cut orders and a separate cost for new orders in order to "better [align] the appropriate costs with the manner in which Verizon MA incurs the costs" (id.). Furthermore, Verizon added new functional organizations that are associated with providing UNEs and replaced the 1996 "Task Oriented Costing" surveys of labor time estimates with surveys conducted in 1999-2000 based on the current wholesale organizations and provisioning processes (id. at 6). Verizon also relied on time and motion studies, performed by Andersen Consulting, for task time estimates for the Telecom Industry Services Operations Center ("TISOC") and a productivity report for the Mechanized Loop Assignment Center ("MLAC") (id.). The original TISOC analysis is based on observations of more than 800 service orders between March and August 1999 (id. at 25).

Verizon uses the same mix of technology in its NRCM as it does in its recurring cost model (i.e., 20 percent copper, 55 percent UDLC, and 25 percent IDLC) (id. at 6). Verizon computes NRCs in Excel-based spreadsheets based on: (1) a disaggregation of the UNE into the relevant tasks (or "activities") within 28 functional organizations; (2) an estimate of the time necessary to perform each of the tasks today; (3) an estimate of the "typical occurrence factor" ("TOF"); (4) an estimate of the forward-looking time; and (5) labor rates. Verizon's proposed NRCs also include common overhead and gross revenue loading factors (Exh. VZ-37, Part I; Exh. VZ-14, at 10-16, exhs. C, D). The typical occurrence factor corresponds with Verizon's estimate of the frequency with which specific tasks currently are required to perform nonrecurring activities (Exh. VZ-14, exh. A). Verizon's estimate of the forward-looking time incorporates adjustments both to recognize that the probability of a particular task being necessary may be less in a forward-looking environment (i.e., the task occurrence factor may be lower) and the time required to complete a task may be less in a forward-looking environment (id. at 23). Verizon's forward-looking adjustments are "based on a panel of experts' assessments of planned system enhancements" (id. at 6).

Verizon computes NRCs separately for standard and expedited ordering intervals (id. at 12). Verizon also computes disconnect costs separately, discounts them based on a 2.5-year forecasted life, and adds these costs to the connect costs to derive the proposed total NRCs (id. at 12-13).

Verizon classifies NRCs in four categories: (1) service order; (2) CO wiring; (3) provisioning; and (4) field installation (id. at 15-16). According to Verizon, it eliminates any possibility of double-recovery of costs from recurring and nonrecurring charges by subtracting "an amount equal to the total nonrecurring revenues from the customer interfacing (service order) and provisioning (network) expenses for the 1999 base year period from which the ACFs are calculated" (id. at 18).

Verizon uses 1999 as the base year for estimating labor rates and levelizes these rates for a two year period (2001-2002) using Verizon's proposed cost of money factor of 12.6 percent (id. at 6). Verizon indicates that as of December 2000, it has provisioned over 75,000 UNE loops in Massachusetts and over 680,000 UNE loops in the Verizon-East jurisdictions, in comparison with the approximate 240 UNE loops that it had completed at the time it gathered 1996 survey data (id.).

B. Forward-Looking Network Assumptions

1. Overview

Verizon asserts that its NRCM assumes a TELRIC-compliant forward-looking network construct. AT&T, WorldCom, and the CLEC Coalition disagree, claiming that Verizon's network assumptions improperly include embedded and inefficient UDLC technology.

2. Positions of the Parties

a. Verizon

According to Verizon, its NRCM "is forward-looking because it seeks to measure the NRCs that Verizon truly expects to incur in the future as it efficiently expands and replaces its network over time" (Verizon Brief at 222). According to Verizon, AT&T/WorldCom assume new technological systems in their NRCM, yet fail to account for the costs of these improvements in their recurring cost model (id. at 223). Verizon's NRCM assumes the same mix of loop technologies as in its recurring model: 20 percent copper, 55 percent UDLC, and 25 percent IDLC. Verizon claims that its assumption of 25 percent IDLC in the NRCM reduces the CO wiring costs associated with new UNE-Ps by 25 percent (id.). According to Verizon, these network assumptions are "aggressively forward-looking, but consistent with Verizon MA's experience deploying up-to-date technology to serve CLECs and consumers" (id. at 224).

Verizon further argues that the CLECs, in contrast, improperly reduce NRCs by relying on hypothetical technologies that are not currently available and that have never been deployed (id.). For example, Verizon dismisses AT&T and WorldCom's assumption that Verizon could use a GR-303 interface to unbundle a fiber-fed loop without the need for either a cross-connect on the MDF or a digital-to-analog conversion (id.; Verizon Reply Brief at 194)). Verizon insists that "the ability to unbundle loops using a GR-303 interface in a multi-carrier environment has simply not been achieved, and the equipment that would be necessary is not even commercially available, nor is it likely to be for the foreseeable future, if at all" (Verizon Brief at 224). According to Verizon, it is not possible to unbundle stand-alone loops for CLECs with the IDLC GR-303 interface using currently available "or even foreseeable" technology (Verizon Reply Brief at 194). Verizon argues that copper or UDLC must be used until the technological issues for GR-303 IDLC-based unbundling are resolved; therefore, according to Verizon, manual cross-connects and the resulting costs cannot be avoided (id. at 195). Furthermore, Verizon asserts that it does assume IDLC in the case of UNE-P (id.).

b. AT&T

AT&T proposes that TELRIC rates be determined assuming a forward-looking network design in which loops on fiber feeder are served using IDLC technology (AT&T Brief at 247). AT&T therefore claims that a forward-looking network should not include UDLC technology or cross-connects at any MDF in the CO (id.). According to AT&T, the Department should not permit Verizon to impose a manual cross-connect charge for IDLC loops because "it would deny CLECs the very efficiency which Verizon provides to itself and which is inherent in the forward-looking network" (id. at 249). AT&T further states that "CLECs should not pay recurring charges based on technology that is placed, in part, to reduce the cost of one-time activities that are recovered through non-recurring rates and then pay non-recurring rates that do not capture these cost savings" (id. at 250).

AT&T highlights Verizon's proposed cost for IDLC to Copper Hot Cut Initial as an example of the inflated costs associated with the inclusion of UDLC technology at the fiber feeder (id. at 248-249). According to AT&T, even without the separate $104.92 field installation cost (required when a dispatch is necessary), the NRC for the IDLC to Copper Hot Cut Initial would be $233.70, which includes a CO wiring cost of $68.43 (id. at 249, citing Exh. VZ-21, Revised NRC, exh. H, line 5). AT&T claims that the CO wiring cost for this element "would be entirely unnecessary for fiber loops which can be unbundled and connected electronically to the switch" (id.). AT&T further states that this element includes an unexplained additional provisioning cost of $31.00 in comparison to the Two Wire Hot Cut Initial proposed by Verizon (id. at 250).

AT&T contends that the reason that Verizon and other ILECs have not yet unbundled IDLC loops at the DS0 level is that they have "no commercial or market incentive to implement efficient IDLC unbundling for [their] CLEC competitors" (id. at 248). AT&T faults Verizon for failing to make an effort to unbundle IDLC (id. at 249).

In response to Verizon's assertion that neither it nor other ILECs have deployed electronic unbundling of loops over IDLC for CLECs, AT&T states that Verizon's logic means that "customers and competitors would always have to wait at the whim of ILECs in order to benefit from the cost savings and process efficiencies of modern technologies" (AT&T Reply Brief at 165). AT&T argues that TELRIC costs should be based upon the least cost, technically feasible solutions regardless of whether they have been deployed by Verizon or other ILECs (id.). AT&T refers to RR-DTE-81 in support of its assertion that electronic unbundling of loops over IDLC is feasible (id. at 166). In summary, AT&T opposes

Verizon's proposed recovery of NRCs for "manual labor required by less efficient technologies simply because it has dragged its feet on the implementation of unbundling IDLC" (id.).

c. WorldCom

WorldCom claims that Verizon's inclusion of UDLC technology in its NRCM fails to conform to "the TELRIC requirement of an efficient, forward-looking, least-cost network construct" (WorldCom Brief at 72). WorldCom argues that the use of UDLC inflates NRCs because it increases the manual labor needed to provision UNE loop orders (id.). WorldCom explains that Verizon's NRCM is fatally flawed because it is inappropriately "based upon Verizon's existing embedded network and the activities that have occurred historically in providing services through that network" (WorldCom Reply Brief at 64). Claiming that Verizon has an incentive not to use the least costly methods available, WorldCom argues that TELRIC costs should not be measured exclusively based on current or planned practices by Verizon or other ILECs (id. at 67). According to WorldCom, the "record establishes that loops may be unbundled electronically over IDLC," and therefore Verizon should not be able to recover charges for the manual labor that less efficient technologies require (id.).

d. CLEC Coalition

The CLEC Coalition claims that Verizon disregards virtually all of the efficiencies otherwise associated with its purported least cost, most technologically efficient network by basing its NRC study upon its existing embedded network (CLEC Coalition Brief at 93-94). By way of example, the CLEC Coalition asserts that Verizon would connect one of its own retail customers using electronic cross-connects (made by the OSS) and yet, when connecting a

CLEC customer, Verizon "assumes backward looking manual cross-connections at the MDF, which are labor intensive, costly and unnecessary in the forward-looking network" (id. at 94). The CLEC Coalition states that Verizon's NRCM inappropriately includes its embedded UDLC in its forward-looking network assumptions (id.). The CLEC Coalition claims that services can be provisioned through IDLC much more efficiently than through UDLC because the "development of IDLC significantly improved quality of service and allowed for the elimination of costly central office equipment" (id. at 94-95).

The CLEC Coalition states that the misplaced use of UDLC in Verizon's cost model results in an inefficient migration process for customers currently served by fiber feeder loops (id. at 95). The CLEC Coalition provides, as an example, Verizon's proposed IDLC to Copper Hot Cut rate. The CLEC Coalition claims that such a migration "should simply involve an electronic cross-connect instruction to move efficiently the customer's IDLC channel to the CLEC's digital facilities," rather than a costly conversion of the IDLC fiber-fed loop to UDLC facilities appearing at the MDF as Verizon proposes (id.). According to the CLEC Coalition, the type of conversion that Verizon proposes is "completely unnecessary in the forward-looking network, and has no purpose other than to inflate NRC costs" (id., citing Exh. ATT-14, at 45). The CLEC Coalition highlights as another problem Verizon's proposed rates for its Two Wire Hot Cut Initial and Additional NRCs. The CLEC Coalition claims that the rates inappropriately indicate 100 percent analog connections at the MDF rather than a fiber to copper network mix of 80 percent to 20 percent, which more appropriately corresponds to the ratio Verizon used for its proposed rates for two-wire loops (id. at 96). The CLEC Coalition proposes that the Department follow the recent decisions of the New Jersey

BPU, the NYPSC, and the Michigan PSC and eliminate UDLC completely from Verizon's cost models (id. at 96-97).

3. Analysis and Findings

The mix of technologies that is assumed in Verizon's network affects the NRCM calculations because the NRCM assumes the same mix of technologies as does its recurring cost model (i.e., 20 percent copper, 55 percent UDLC, and 25 percent IDLC) (Exh. VZ-14, at 6). We concur with Verizon that recurring and NRC models for UNEs should be based on the same network assumptions. See Phase 4-L Order at 16-19. We address the parties' positions on Verizon's network assumptions, including its deployment of fiber and IDLC in Section VI (Outside Plant Inputs). We direct Verizon to incorporate the technology mix directed in that section for the purposes of its recurring cost study in its NRC study. In its compliance filing, Verizon must document clearly the way in which the revised technology mix affects the calculations in its NRCM.

C. Classification of NRCs

1. Overview

Parties dispute what constitutes a "nonrecurring" cost. Verizon argues that its NRCM complies with TELRIC and appropriately distinguishes between recurring and nonrecurring costs since its model recovers costs in the manner in which they are incurred. AT&T claims nonrecurring charges should only recover those costs that benefit only the CLEC that orders the activity. AT&T claims that the cost of activities that benefit Verizon or any other subsequent users of a facility in addition to the ordering CLEC should not be recovered through nonrecurring charges. AT&T, WorldCom, and the CLEC Coalition state that

Verizon's misclassification of costs results in excessive NRCs that stand as a barrier to competitive entry. This difference in viewpoints significantly affects NRC calculations.

2. Positions of the Parties

a. Verizon

Verizon asserts that its NRCM appropriately distinguishes between recurring and nonrecurring costs and describes NRCs as those "incurred in response to a specific event initiated by a specific cost-causer and [that] generally involve easily identifiable, concrete costs" (Verizon Brief at 214, 232). Verizon argues that this approach distinguishes a NRC as a cost that "is occasioned by the particular CLEC order and arises from activities that would not be untaken but for that order" (id. at 233). Verizon cites the FCC's Local Competition Order in support of its claims that it is "entitled to recover one-time costs caused by a CLEC order on a non-recurring basis from that CLEC" (id. at 232, citing Local Competition Order at ¶¶ 742–743; Verizon Reply Brief at 214).

Verizon further argues that cost recovery from the cost-causer is a sound rate-setting practice that ensures economic efficiency and an appropriate allocation of risk. This economic efficiency position professes to ensure that the costs Verizon actually incurs are neither under-recovered nor over-recovered. Dr. Taylor testified that to "do otherwise – i.e., to recover this cost through higher recurring charges – would require that an expense that is known with certainty be spread across an estimate of some measure of usage over time" and further stated that this "approximation increases the likelihood that costs will be under or over-recovered, which leads to inefficiencies" (Exh. VZ-2, at 19-20).

Verizon claims that cost recovery from the cost-causer eliminates an inappropriate risk burden on the ILEC; the alternative, recovering a cost that "arises from activities that would not be undertaken but for that order" through recurring charges, places an unfair burden on the ILEC according to Verizon (Verizon Brief at 232). Verizon claims that its proposed process ensures appropriate economic decision-making: "In order to ensure that the CLEC has the correct incentives to target customers, invest in facilities and establish efficient prices, it should be required to pay the full amount of the costs that are a direct result of its actions" (Exh. VZ-2, at 19). Verizon cites the FCC's statement that "Commission policy favors economically efficient prices that reflect the manner in which costs are incurred" (Verizon Reply Brief at 233, citing In the Matter of MCI Telecommunications Corp. Application for Review, Order, 12 FCC Rcd 16565, 16571, FCC 97-350, at ¶ 12 (rel. October 7, 1997)). Furthermore, Verizon contends that, contrary to AT&T/WorldCom's assertions, Verizon will not double-recover costs through recurring and nonrecurring costs because, according to Verizon, it subtracted from its base year expense figure all the nonrecurring revenues it received during that year (Verizon Brief at 234).

Verizon asserts that the CLECs' criticisms that Verizon improperly distinguishes between recurring and nonrecurring costs and double recovers its costs are unsupported by the evidence (Verizon Reply Brief at 213). Verizon further argues that the CLECs failed to provide any support for their definition that NRCs should be defined as only those arising from activities that can never benefit another carrier at some future time (id.). Verizon contends that, "if a LEC makes a one-time expenditure for the purpose of provisioning an order in real time for a specific CLEC, it should not be forced to attempt to recover those costs as a recurring charge over a long period of time from indeterminate CLECs" (id. at 215).

Verizon explains that the cost of field installation activities to place a cross-connect at the feeder-distribution interface is not analogous to the cost of a NID or plug-in because, according to Verizon, the latter network components are dedicated permanent parts of a loop whereas the cross-connect is not permanent (id. at 216). Verizon indicates that it may leave the cross-connect in place after a customer discontinues services, but it may also move the cross-connect if needed to serve another customer (id. at 216-217).

Verizon explains that it capitalizes the cost of constructing a loop and recovers those costs in its recurring charges, and does not capitalize the cost of provisioning a loop (including the placement of cross-connects) and recovers those costs through nonrecurring charges (id. at 217). Verizon also opposes AT&T's proposal to eliminate NRCs in exchange for a slightly higher recurring loop charge because, according to Verizon, it would violate basic economic principles and because nonrecurring revenue has increased dramatically since 1999 (id. at 218-220). Verizon explains that because the UNE market was just beginning to develop in 1999, the amount of nonrecurring work in 1999 would necessarily be less than it is today and that "there is every reason to believe that nonrecurring revenue has increased dramatically since 1999 because of the increased volume and new types of UNE orders" (id. at 219).

b. AT&T

AT&T argues that Verizon does not "provide any reasoned distinction between those UNE costs that it seeks to recover through recurring monthly charges, and those that it seeks to recover up front through a non-recurring charge" (AT&T Brief at 236). In support of its position, AT&T states that most of the costs Verizon proposes to recover through recurring monthly charges are related to one-time expenses, such as the purchase of switches and other facilities, and therefore it "is the charge that recurs or does not recur, not the underlying cost" (id. at 237).

AT&T asserts that NRCs should include the cost of activities that benefit only the initial cost-causer. According to AT&T, the cost of activities that benefit Verizon or subsequent users of a facility, as well as the ordering CLEC, should be recovered through recurring rates (id.). AT&T states that if "the first telecommunications provider to use the facility bears all the forward-looking costs of a one-time activity benefiting multiple users, then obviously the first user will be forced to pay more than its fair share" (id. at 238).

AT&T contends that field installation and loop maintenance activities benefit Verizon's network and thus are available to benefit subsequent users (id. at 238-240). AT&T asserts that field installation tasks are "part of building a loop element and so are properly recovered in the recurring rate for that loop, not [in an] onerous one-time, up-front charge" (id. at 238). By way of example, AT&T contends that Verizon's NRC panel "admitted that an intermediate cross-connection at a feeder distribution interface or serving area interface stays connected in the normal situation even after service is discontinued and so benefits subsequent entities seeking a loop provided through the same interface" (id. at 238-239).

AT&T opposes the recovery of the costs of repairing defective outside plant through a nonrecurring charge (id. at 240). AT&T proposes that loop maintenance costs be recovered through recurring rates since expenses for maintenance and repair benefit not only the initial cost-causer, but also any subsequent users of the element, including Verizon itself. AT&T

cites the Local Competition Order to support its position that maintenance expenses should be recovered through recurring charges (id. at 239-240, citing Local Competition Order at ¶ 745).

AT&T states that Verizon's proposed NRCs violate a basic principle of TELRIC that prohibits "an incumbent LEC [from] recover[ing] more than the total forward looking economic cost of providing the applicable element" (id. at 243, citing 47 C.F.R. § 51.507(e)). As a result, AT&T states that "the plant rearrangement, maintenance and coordination related expenses Verizon seeks to recover in field installation and provisioning NRCs should be rejected because they are already recovered though the network factors Verizon used to calculate its recurring costs" (id.).

AT&T claims that Verizon's Network ACF permits Verizon to recover through its recurring UNE charges the same categories of costs that Verizon is trying to assess as NRCs, which would result in a double recovery of costs (id. at 241). Verizon's Network ACF "represents the ratio of network-associated expenses (e.g., maintenance, repair, rearrangement, testing, administration and staff support) to investment" (Exh. VZ-37, Part G-5, at 1). AT&T explains that "this factor is specifically designed to capture the costs of 'moves and rearrangements' (the 'M' subfactor) and repairs (the 'R' subfactor)" (AT&T Brief at 241, citing Exh. VZ-37, Part G-5, "Overview of Factor Methodology," Tab 1.NtwkFctr). These two subfactors cover costs associated with moving wires, other rearrangements of plant, and repairs for all categories of Verizon's switching, circuit, and outside plant equipment (id. at 241-242, citing Exh. VZ-37, Part G-5, Tab 5, M&Rexp., Tab 6.M, Tab 7.R). AT&T claims that these dollars should be recovered through recurring charges because rearrangements fall under the maintenance category of the recurring expense (id. at 242). AT&T further highlights CO and outside plant activities, recovered under Network ACF "Other" subfactors, as categories of costs that Verizon seeks to impose anew through NRCs (id.). According to AT&T, defective loop plant generating a field installation NRC is resolved by loop rearrangements (id., citing Tr. 4, at 687-688). AT&T states that "rearrangements are covered by the 'M' factor in the recurring rates, but Verizon also seeks to impose a field installation NRC when such rearrangements occur in the process of provisioning a CLEC loop" (id.).

AT&T states that Verizon's adjustment to avoid charges of double-counting "makes no sense, and does not comport with TELRIC" (id. at 244). Verizon's approach "subtracts from the expenses reflected in the Network ACFs an amount equal to the total non-recurring revenues from the customer interfacing (service order) and provisioning (network) expenses" (id. at 243, citing Exh. ATT-VZ 6-1). AT&T claims that this reduction is an admission by Verizon that all of its NRCs are for expenses that are covered by its ACFs (id. at 243). AT&T therefore recommends that the Department increase Verizon's proposed loop rates by 2.2 percent[169] to cover fully the purported service ordering and provisioning costs upon which Verizon bases its proposed NRCs (id. at 245). According to AT&T, "reversing the NRC Revenue Adjustments in Verizon's development of its Network Wholesale Marketing ACFs and then eliminating all field installation and provisioning activities from the NRCs assures that Verizon will recover such costs only once through recurring rates" (id.). AT&T claims that

[169] This figure is the result of zeroing out the NRC revenue adjustments in the Network and Wholesale Marketing ACFs (see AT&T Brief at 245).

this approach complies with TELRIC methodology more appropriately than Verizon's methodology (id. at 246-247). AT&T further states that such an adjustment demonstrates that the Department can eliminate allegedly high NRCs that could serve as a barrier to competitive entry, while permitting Verizon to fully recover its expenses (id. at 246).

Responding to Verizon's explanation that it applies a NRC revenue adjustment to its modeled ACFs as a way to prevent double-recovery of costs, AT&T contends that this methodology is "convoluted" and is "essentially a concession that, in the absence of machinations, many of the one-time costs Verizon seeks to recover in the nonrecurring charge are already recovered through recurring rates" (AT&T Reply Brief at 161). AT&T argues that the best way to avoid double recovery is to treat all plant rearrangement and maintenance expenses the same by including them in the ACF calculation (id. at 162).

AT&T asserts that it "makes no sense" that Verizon should be allowed to impose a one-time field dispatch NRC on CLEC orders while, for retail services, it recovers these costs in its recurring monthly rates (id. at 159). AT&T further argues by way of analogy that if the upholstery on the seat to which an airline passenger had been assigned were ripped, the airline industry would not recover the cost of repairing that seat from that particular customer, but rather from all users through a recurring charge, and that, similarly, the costs that Verizon incurs to provide a functional loop should be recovered through recurring charges imposed on all users (id. at 159-160).

AT&T explains further that, contrary to Verizon's assertion, AT&T does not advocate that Verizon permanently dedicate a feeder pair to each distribution pair at the time of a field cross-connect but rather that Verizon should manage its plant "as it sees fit" (id. at 163).

AT&T does oppose, however, Verizon's recovery of network rearrangement costs through a one-time NRC, and argues further that the "most likely beneficiary of this inequity would be Verizon" (id. at 163-164). According to AT&T, when a CLEC cancels the loop UNE, Verizon then benefits by using that outside plant to serve its own retail customers, without incurring any cost to establish a functional loop, while being able to keep the NRC revenue (id. at 164).

c. WorldCom

WorldCom urges the Department to "purge Verizon's [NRC] model of the inherent inefficiencies and unfair practices identified in Mr. Walsh's testimony" (WorldCom Brief at 74). WorldCom argues that Verizon's NRCM improperly seeks to recover costs recurring in nature through NRCs (id. at 73). WorldCom claims that NRCs should not include charges for elements that benefit Verizon's network in general (id.; WorldCom Reply Brief at 68). WorldCom highlights two types of tasks it believes Verizon has misclassified as NRCs: database or system maintenance charges and field cross connects at the serving area interface (WorldCom Brief at 73). WorldCom proposes that both expenses be recovered through recurring charges since such an investment would benefit not only the initial cost causer, but also other CLECs and Verizon itself (id.; WorldCom Reply Brief at 68). WorldCom states that Verizon fails to alleviate the concern that shifting field dispatch costs to NRCs will result in over-recovery and inequitable treatment of CLECs (WorldCom Reply Brief at 68). As WorldCom contends, the issue of an asset's "reusability" is a key determinant under TELRIC in correctly identifying costs as recurring or nonrecurring (id.). WorldCom states that the "most likely beneficiary of this inequity would be Verizon" (id. at 69). According to

WorldCom, an example of this alleged "windfall" for Verizon would be "where a CLEC has paid Verizon's exorbitant NRC for field dispatch to place a cross-connect at the FDI and subsequently cancels the service" (id.). To avoid this situation, WorldCom asks the Department to order Verizon to recover costs that may benefit multiple users through recurring charges (id. at 68).

d. CLEC Coalition

The CLEC Coalition claims that Verizon has misclassified certain recurring costs as NRCs. According to the CLEC Coalition, "the benefit of the task at issue must be examined. If the task is necessary on every CLEC request for a particular UNE, and produces an exclusive benefit to only the CLEC, then it is most probably a non-recurring cost" (CLEC Coalition Brief at 119). The CLEC Coalition highlights as an example of Verizon's misclassification the costs for the physical cross connection at a FDI of a loop's feeder and distribution plant. It argues that "this one-time activity benefits all future users of a particular telecommunications facility and the costs of the activity are properly characterized as recurring" since the costs associated with the activity are neither temporary nor exclusive (id.). The costs for the repair of defective outside plant are another misclassified NRC according to the CLEC Coalition since such an investment does not exclusively benefit the ordering CLEC (i.e., the repair benefits Verizon as well). The CLEC Coalition therefore proposes that the costs for the repair of defective outside plant be recovered through recurring charges as is the case when "defective outside plant is encountered [by Verizon] on a retail order" (id. at 120).

3. Analysis and Findings

A cross-connect at the FDI is installed by Verizon in order to fulfill CLEC orders and may be left in place after a CLEC discontinues service or may be moved if needed to serve another customer (Tr. 3, at 540). Thus, the field installation costs that Verizon incurs to fulfill a CLEC order may benefit a CLEC exclusively or may benefit future customers, including Verizon, if Verizon becomes the carrier serving the retail end user when a CLEC discontinues service. When end users migrate back to Verizon from a CLEC, Verizon benefits directly from tasks associated with making loops functional (Exh. VZ-14, at 14; see also Tr. 3, at 540-541).

If, in fulfilling a wholesale order, Verizon must remedy defective outside plant, it proposes to recover the cost of such activities from the CLEC because the CLEC's order is the "triggering" event (Tr. 4, at 679). In the retail environment, Verizon computes service order installation costs based on an estimate of the percentage that would require a field dispatch, and does not impose the cost on the particular customer who happened to "trigger" the need for loop work (id. at 680-681). If Verizon must fix defective outside plant in fulfilling a retail order, it recovers such costs through its retail charges (id. at 679-681). Verizon's witness stated that, "It's my understanding that the cost of a dispatch, if you will, in general for a retail customer is recovered across all orders, whether a dispatch occurs or not" (id. at 680).

Verizon, in some instances, such as when the cross-connection between the feeder cable and the distribution cable remains in place after a CLEC discontinues service, will avoid incurring field installation and loop maintenance work as a direct result of having conducted such work to fulfill a CLEC order in the past (Tr. 3, at 539-541). Should Verizon then directly serve the same end-user through its own retail offering, it will benefit from avoiding these costs. An equitable cost recovery therefore should not shift the field dispatch cost to the CLEC as an NRC. In those instances where the field installation tasks are necessary to fulfill a CLEC order, Verizon's proposed NRCM would always impose these field installation costs on the CLECs as NRCs.

Furthermore, the approximate $100 field dispatch nonrecurring cost represents a significant barrier to entry. The FCC stated that:

> [S]tates may, but need not, require incumbent LECs in an arbitrated agreement to recover nonrecurring costs, costs that are incurred only once, through recurring charges over a reasonable period of time. The recovery of such nonrecurring costs through recurring charges is a common practice for telecommunications services. Construction of an interconnector's physical collocation cage is an example of a nonrecurring cost. We find that states may, where reasonable, require an incumbent LEC to recover construction costs for an interconnector's physical collocation cage as a recurring charge over a reasonable period of time in lieu of a nonrecurring charge. This arrangement would decrease the size of the entrant's initial capital outlay, thereby reducing financial barriers to entry. At the same time, any such reasonable arrangement would ensure that incumbent LECs are fully compensated for their nonrecurring costs.

Local Competition Order at ¶ 749.

Verizon's proposal to recover these costs in a nonrecurring manner unfairly penalizes the CLEC, which, by circumstances that it cannot control, happens to be the carrier that requests a UNE where field dispatch occurs. A more equitable way to compute the costs of field dispatch and to minimize the barrier to entry is for Verizon to recover these costs through its ACF.

Verizon also inappropriately includes loop maintenance costs in its NRCM. The FCC stated that, "we determine that maintenance expenses relating to the local loop must be recovered through the recurring loop charge, rather than through a nonrecurring charge imposed upon the entrant." Local Competition Order at ¶ 745. Accordingly, Verizon should recover loop maintenance costs through its ACF. Verizon contends that there are certain maintenance activities that it would not incur except when necessary to fulfill specific orders. As with field dispatch costs, by increasing the NRC, the inappropriate recovery of loop maintenance costs creates an unnecessary barrier to entry. Furthermore, the recovery of such costs from the CLEC that happens to have ordered UNEs where loop maintenance activity is required unfairly penalizes the CLEC because the CLEC cannot control whether Verizon's network requires maintenance.

Verizon explains that it prevents double recovery of loop maintenance and field dispatch costs by subtracting 1999 nonrecurring revenue from base year expenses in its calculation of the ACF (Verizon Reply Brief at 217, citing Exh. VZ-14, at 18). This mechanism is intended to ensure that network-related costs are not recovered both through the NRCs and through the recurring costs. For the reasons discussed above, the Department finds that Verizon should instead recover loop maintenance and field dispatch costs through the ACF. Accordingly, Verizon is directed, in its calculation of the ACF, to leave intact the approximate $35 million associated with nonrecurring revenues. Thus the revised ACF will include a component that includes an allowance for field dispatch and loop maintenance, and the mechanism will ensure that Verizon recovers these costs evenly from all CLECs (Exh. VZ-37, Part G-5, Sheet 4.Rev). This methodology complies with the FCC's requirement that "state commissions take steps to ensure that incumbent LECs do not recover nonrecurring costs twice and that nonrecurring charges are imposed equitably among entrants." Local Competition Order at ¶ 750.

D. Task Time Methodology

1. Overview

Verizon computes NRCs based, in part, on its employees' estimates of the time required to perform the various tasks required to provide UNEs. Verizon surveyed employees and, in the survey, instructed respondents to indicate the average time required to complete the work process activities for each of the UNEs under study. Verizon indicates that it then analyzed and validated the survey data for statistical accuracy (Exh. VZ-14, exh. A, at 6).

2. Positions of the Parties

a. Verizon

According to Verizon, "the task times upon which Verizon MA's non-recurring charges are based were generally developed through the use of extensive and well-grounded surveys that were evaluated for statistical reliability" (Verizon Brief at 213). Verizon emphasizes that the work times for its NRCM are based on surveys from respondents with real-world experience performing the tasks at issue (id. at 216). Verizon describes a three-step process for conducting its work time surveys: (1) determine activities necessary in the provisioning of wholesale UNEs; (2) survey Verizon employees to ascertain the amount of time to perform each activity; and (3) have a statistician examine and validate survey results (id. at 214).

Verizon argues that the data from its work time surveys are "relevant and reliable" for a number of reasons (id. at 216). First, according to Verizon, the sample was sufficiently random and large to generate accurate cost estimates (id.). Second, there was an internal review process of the survey responses that reinforced "the accuracy and completeness of the sample size" (id. at 217). Third, a Verizon statistician identified and removed two potentially troubling outliers (id.). Fourth, Verizon SMEs "determined that the average times were reasonable and consistent with their knowledge and expertise" (id. at 217-218). Fifth, Verizon submitted confidence intervals to support Verizon's costs at the request of the Department (id. at 218). Verizon states that its "non-recurring cost model is based on a sound methodology that is designed to accurately estimate the time it presently takes Verizon employees to perform the tasks required to provision UNEs, as a starting point for determining forward-looking times" (id.).

Verizon contends that AT&T's model is "nothing more than the unfounded opinions of a few 'experts'" and that its task time estimates are "pure guesswork" based on "wishful thinking" whereas, according to Verizon, its estimates "are based on concrete and relevant evidence" (Verizon Reply Brief at 203-204). Verizon asserts that the CLEC Coalition either misunderstands or misrepresents Verizon's model by assuming erroneously that Verizon's surveys were completed by SMEs, when instead, they were completed by employees who perform the tasks being studied (id. at 205). According to Verizon, contrary to the CLECs' assertion, Verizon's employees may have had an incentive to understate their task times "so as to avoid identifying themselves as unproductive" (id. at 206). Furthermore, Verizon contends that the survey respondents "had no sense of how Verizon uses the surveys to develop costs" (id. at 205-206).

Verizon contends that its samples are representative because "Massachusetts is a microcosm" of the regional network and because the samples include simple and complex transactions performed in urban, suburban, and rural environments (id. at 208). Verizon argues that the precision levels it computed demonstrate that its sample sizes are sufficiently large (id. at 208-209). Responding to the CLEC Coalition's criticism that Verizon did not weight survey responses based on the frequency with which the survey respondent performed the task, Verizon states that (1) the CLEC Coalition did not explain how it proposed such a weighted calculation be performed; (2) the CLEC Coalition neglected to account for the additional complexity and subjectivity associated with such a measure; and (3) Verizon's experts and a statistician, after reviewing the survey results, "concluded that all of the average times were within reasonable expectations" (id. at 209).

Verizon contends that, contrary to the CLEC Coalition's concern, variation in the respondents' work times is not troubling, but rather can be explained by such differences as the size of the CO affecting the task time required (id. at 210, n.192). Verizon also asserts that the mean is the best measure of the task time and that the use of the minimum or median, as the CLEC Coalition proposes, would be statistically unsound (id. at 210-211).

In support of its statistical analysis, Verizon indicates that a "trained statistician using accepted statistical methodologies" analyzed the survey responses and that "all but a few of Verizon's times are within 10 percent of the actual times" (id. at 212, citing RR-DTE-14).

b. AT&T

AT&T identifies three flaws in Verizon's task time methodology. AT&T contends that the surveys, conducted in 1999, lock in embedded task time inefficiencies and neglect forward-looking improvements. Second, AT&T claims that the survey process was biased. According to AT&T, Verizon's "employees understand that longer work times will translate to higher costs," which encourages the survey respondents to pad the work time estimates in an attempt to "defeat the CLECs" (AT&T Brief at 258-259). Third, AT&T raises issue with "the variation in survey results for the same task and the small sample size for many tasks" and indicates that, for example, task times for key activities ranged between one minute and 20 minutes (for a particular CO frame task) and from two minutes to 90 minutes (for a different CO frame task) (id. at 259). AT&T argues further that Verizon did not explain how it selected survey respondents (id.). AT&T contends that Verizon's work task surveys are an inappropriate basis for computing TELRIC-compliant costs (AT&T Reply Brief at 173).

c. WorldCom

WorldCom claims that Verizon's reliance on its survey of embedded processes to cost forward-looking rates is not appropriate for a TELRIC-based cost study (WorldCom Reply Brief at 65). WorldCom states that Verizon's survey of its own employees is inherently biased (id.). WorldCom further argues that the statistical methodologies underlying Verizon's NRCM are flawed (id.). WorldCom therefore proposes that the Department reject Verizon's survey results and the NRCs based on them (id. at 66).

d. CLEC Coalition

The CLEC Coalition claims that Verizon's NRC "model is not suitable for the calculation of TELRIC-based NRCs, and, therefore should be rejected by the DTE" (CLEC Coalition Brief at 93). As an alternative, the CLEC Coalition proposes that the Department order Verizon to adjust its NRCM by requiring Verizon "to use the minimum work times in its survey in calculating its NRCs" (id.).

The CLEC Coalition lists a number of alleged deficiencies related to Verizon's task time estimates. First, the CLEC Coalition argues that Verizon's reliance on regional information, not specific to Massachusetts, is an inappropriate method to generate rates applied in Massachusetts (id. at 98). Second, it states that Verizon's task time surveys are tainted by the inclusion of a number of layers of subjective opinion (id. at 99-100). Third, the CLEC Coalition identifies an inherent flaw and an alleged bias within Verizon's survey instructions that could encourage the survey respondents to embellish work time estimates (id. at 100-101). Fourth, the CLEC Coalition claims that, unlike the previous UNE proceeding in 1996, Verizon's surveys in this proceeding elicited information pertaining only to the average time a task takes, rather than the minimum, average, and maximum times.[170] According to the CLEC Coalition, "the lack of information elicited further undermines the survey" (id. at 102). As a result, the CLEC Coalition proposes that "the DTE should use the minimum times of the survey respondents" (id. at 103). Fifth, the CLEC Coalition perceives the sample size of the surveys as too small and therefore problematic (id. at 104). According to the CLEC Coalition, the confidence intervals "[do] not heighten 'confidence' in the survey times because there has been no opportunity to investigate or validate the statistical analysis presented" (id. at 105). As a result, the CLEC Coalition concludes that, "the DTE should attach no weight to

170 While the CLEC Coalition claims Verizon's past survey compiled the average times necessary to complete a task, the survey actually registered the "most likely" times necessary to complete a task. See Phase 4-L Order at 24.

Verizon's surveys and require Verizon to conduct time and motion studies for its NRCs" (id. at 106).

Responding to Verizon's claim that it conducted a statistically sound survey of its workers, the CLEC Coalition contends that "the very foundation of Verizon's nonrecurring costs is undermined biased and unreliable task times" (CLEC Coalition Reply Brief at 2). The CLEC Coalition also argues that Verizon should have taken employees' experience into account when it conducted the survey (id. at 2-3). Furthermore, according to the CLEC Coalition, the use of sample sizes of ten and below undermines the credibility of the statistical analysis (id. at 3-4). The CLEC Coalition expresses skepticism about Verizon's removal of outliers, and explains that the range of task times of between two minutes and 180 minutes in one instance, and between two minutes and 480 minutes in another instance suggest that Verizon did not remove a sufficient number of outliers (id. at 5).

The CLEC Coalition, responding to Verizon's assertion that there is no support for a finding of bias, states that the first two paragraphs of the survey clearly indicate that the data provided in the responses will affect the rates charged to CLECs (id. at 6). Finally, the CLEC Coalition argues that, based on Verizon's explanation that work times can vary enormously based on whether they are simple or complex orders, Verizon should have defined tasks to limit this variation (id.).

3. Analysis and Findings

Verizon bases its calculation of NRCs in large part on its employees' estimates of the time necessary in today's environment to complete the tasks associated with the provision of

UNEs (Verizon Brief at 218). Verizon then applies forward-looking adjustments to these time estimates, which we discuss in the following section.

AT&T and the CLEC Coalition raise concerns about the following aspects of Verizon's survey techniques: the sample sizes in Verizon's survey, the sample variation, potential bias, the "open-ended" task descriptions, the use of surveys in 14 Bell Atlantic states (as opposed to surveying only Massachusetts-based employees), and the fact that the survey process did not follow the task-oriented costing approach that Verizon used in 1996, which surveyed respondents' estimates of the minimum, most likely, and maximum times necessary to complete a task (AT&T Brief at 258-259; CLEC Coalition Brief at 98-104). See Phase 4-L Order at 24. We address these and other issues concerning Verizon's survey below.

AT&T and the CLEC Coalition claim that Verizon's sample sizes are too small and the variation too great (AT&T Brief at 259; CLEC Coalition Brief at 104). Sample sizes affect the dispersion (or variance) of the data gathered. The sampling variance declines as the sample size increases and the "'best' estimator will be understood to mean the unbiased estimator with the smallest sampling variance."[171] In other words, the smaller the variance, the greater the precision of the estimate obtained. However, as Verizon indicates, it "is the sample, and not the fraction of the population sample, which almost entirely determines the precision of the estimation" (Tr. 4, at 624). Verizon explains how it computed confidence or precision intervals:

> And since you have an average time times a typical-occurrence factor times a forward-looking adjustment factor times a labor rate, you plug in in lieu of the average time the variance and square all the constant terms out in front of it --

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171 Alan Stuart, The Ideas of Sampling at 13, 16 (1984) (emphasis in original).

> namely, the labor rate, the typical-occurrence factor, the forward-looking adjustment factor. We do that for every -- we essentially use the model structure to compute the variance for the components of the charges: provisioning, CO wiring, service order, and manual surcharge. And since the calculations are already embedded in the model, all I really need to do is go and square all the constant terms, replace means with variances, which I can calculate from the surveys, and I have essentially a variance version of the nonrecurring model. I combine that variance version with the time version and come up with a 95 percent precision level [id. at 630].

Verizon explains that it "did not construct confidence intervals around the times. [It] constructed confidence intervals around what's really relevant here, the nonrecurring costs. The times are only relevant insofar as they affect the cost" (id. at 628). This rationale is reasonable, subject to the caveats we discuss in more detail below.

However, the CLECs' concern about the wide range in responses provided has merit. Although the variation does not, per se, render the computed average invalid, if some characteristic of the responses contributes to the wide range in task times reported by Verizon's employees (e.g., whether the response was in an urban or rural CO), the range could indicate that Verizon should have modified its survey technique. The wide range of times reported for some tasks could indicate that Verizon should have either (1) methodically stratified its sample; or (2) as the CLEC Coalition suggests, defined its tasks more narrowly so that, for example, responses about simple orders would not be mingled with responses about the significantly more time-consuming complex orders (RR-DTE-13).

We are not persuaded, however, that the CLEC Coalition's concern about having adequate "opportunity to investigate or validate the statistical analysis presented" has merit (CLEC Coalition at 105). We concur with Verizon that the underlying data have been provided and that the CLEC Coalition thus had the opportunity to validate or invalidate

Verizon's analysis. Furthermore, parties also had the opportunity to ask for supporting information to the task times, such as confidence intervals, anytime after Verizon submitted its NRCM in May of 2001, and thus the CLEC Coalition could have initiated such an investigation early in the proceeding.

Another criticism of Verizon's survey is that there is potential bias on the part of Verizon's survey respondents.[172] Verizon's letter to the head of each work group states to "be successful in our upcoming proceedings, we must be able to present well-documented costs that are accurate and credible" and further explains that "[a]nything less jeopardizes our ability to recover our costs and strengthens the positions of our opponents (AT&T, MCI WorldCom, Sprint, etc.) who present their own estimations of what our costs should be" (Exh. VZ-14, at 25, exh. J at 1). The instruction form provided to each survey respondent states that "[t]hese studies will support rates for ordering, provisioning and installing all UNEs, products and services the Company is expected to provide" (Exh. VZ-14, exh. K at 1). Although Verizon stated that the "survey respondents are much more likely to under-report their average time experience so as to avoid identifying themselves to their supervisor as being a particular unproductive individual," we concur with the CLECs that the survey is more likely to result in over-estimates of task times because the results are used to compute costs that Verizon will charge to its competitors (Tr. 4, at 755).

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172 From a statistical perspective, bias typically refers to selection bias or to estimation bias. The former, if applied here, would concern the way in which the respondents were selected (an issue we address later in this section), rather than whether the respondents had a particular incentive to misreport their task time estimates. Avoiding estimation bias means that, on average, the deviation of the sample average from the parameter value (i.e., the true population average), is equal to zero. Verizon's use of the average is, in this latter sense, an unbiased estimator.

A potential for bias exists when a survey is compiled without independent oversight of the process.[173] As the Department previously ruled, "[t]here is also a strong likelihood of bias when employees are instructed to provide estimates that they are told will be used to derive charges for their employer's competitors. Bell Atlantic failed to demonstrate that it acted to reduce the probability of such bias." Phase 4-L Order at 25. Similar bias is inherent in Verizon's survey in this proceeding as well.

In response to the potential for upward bias in the task time estimates, the CLEC Coalition proposes that the Department order Verizon to use the minimum task times as ordered in the Consolidated Arbitrations. See Phase 4-L Order at 25. But such a proposal ignores the significant distinctions between the task time surveys Verizon conducted in 1996 and the task time surveys conducted for this proceeding. In the 1996 proceeding, Verizon surveyed its employees to determine the "minimum," "most likely," and "maximum" time necessary to complete a task. The Department considered the work time estimates submitted then biased and not forward-looking. The Department's decision to use the average of the minimum work times reported was a remedied response to these deficiencies. Id. at 24-25. In this proceeding, Verizon submitted an average time estimate for each task time that represents the "actual time it does take to perform the activity in its entirety, not the time it should take" (Exh. VZ-14, exh. K at 2). These actual work time estimates serve as a foundation from which to predict forward-looking work times. The Department consequently does not have the option to order Verizon to use the average of the minimum times, as the CLEC Coalition

[173] One notable exception is the time-and-motion studies compiled by Andersen Consulting for the TISOC work activities, which were submitted in May 2001 as an attachment to Verizon's testimony and then revised in December 2001.

proposes, because no such figure exists in this proceeding. The use of the minimum task time reported would be inappropriate because it would fail to capture the information provided by the entire sample.

We have addressed several of the CLECs' specific concerns about Verizon's statistical analysis. Because the statistical validity of Verizon's analysis has been generally disputed, we will consider more comprehensively the larger issue of whether Verizon submitted adequate support for its task time samples and survey methodology. Verizon's NRC study calculations depend on, among other things, estimates of times necessary to complete many different specific tasks. The population of Verizon employees who conduct these tasks includes, in some instances, as many as 1,731 people, and in other instances as few as two people (Exh. CC-VZ 12-1). The universe of potential respondents includes employees throughout the 14-state former-Bell Atlantic jurisdiction (Tr. 4, at 620). In order to estimate the actual average times of the entire population for completing various tasks, Verizon surveyed samples of its employees, with sample sizes ranging between zero and 147 people (Exh. CC-VZ-12-1).

The use of a sample to estimate the actions of the larger population (i.e., all employees who perform the task in the 14-state region) requires us to consider the statistical validity of Verizon's approach. The validity depends on (1) accurate reporting by the respondents; (2) avoiding selection bias (i.e., as necessary, stratifying the sample for such attributes as years of employees' experience, CO type, order type, and also generally obtaining a random sample); (3) whether Verizon's representation, that the dispersion of the task time sample data is irrelevant, is reasonable, and instead, the dispersion of the resulting NRC costs is the relevant characteristic by which to measure the precision of the statistical estimate; and (4) whether the precision yielded by the sampling is sufficient. We also address whether respondents' incentive to over-estimate task times may have affected the results above.

Avoiding selection bias requires obtaining a representative, random sample, which, in turn is essential to deriving valid results. The statistics treatise to which Verizon's witness referred also states that:

> If you feel at times that the statistician, in his insistence upon random sampling methods, is merely talking himself into a job, you should chasten yourself with the reflection that in the absence of random sampling, the whole apparatus of inference from sample to population falls to the ground, leaving the sampler without a scientific basis for the inference which he wishes to make.[174]

The evidence is mixed regarding the degree to which Verizon succeeded in obtaining a random sample of the larger population. Verizon was unable to describe and could provide no written documentation about the criteria that cost analysts used to conduct a random sample in those instances where the population was over 1,000 (Tr. 4, at 643-647). Verizon's witness, who sponsored the statistical analysis of the nonrecurring testimony, indicated that he gave guidance to those gathering data but was unable to substantiate that the data indeed are based on a random sample, and did not himself review the cost analysts' sampling techniques. When asked, "[b]ut for the larger universes, the ones that are over 1,000, there's no additional information you can give me about the way that they [the samples] were determined throughout the 14 Verizon state jurisdictions?" Verizon's witness responded, "I don't have anything that would, I think, help you out in that regard" (id. at 647). Furthermore, Verizon did not conduct any pilot surveys to assess whether statistically significant differences exist among different strata within the population.

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174 Stuart, The Ideas of Sampling at 23.

Task time estimates may be correlated with years of experience, CO sizes, whether the task was a simple or complex one, or other factors. If, for example, more experienced employees take less time (or more time) to complete requisite tasks than less experienced employees, ideally the survey would have been designed in such a way as to ensure that the full spectrum of employees were proportionally represented. The entire population of Verizon employees who perform the relevant tasks consists of employees with a range of experience performing the task. It may thus be necessary to obtain a stratified sample in order to obtain a representative sample. By way of illustration, if a sample included only employees with less than a year of experience or only employees with ten years of experience, the sample would not be representative of the larger population, which could lead to inaccurate results. Verizon could have enhanced the statistical rigor of its survey had it conducted an analysis to determine whether the mean of a sample of employees with relatively more experience differed significantly from the mean of a sample of employees with relatively less experience. This analysis would have allowed Verizon to determine whether a stratified rather than a simple random sample was appropriate. Verizon chose not to ask in its survey instrument for either the number of years a respondent had been a Verizon employee and/or the number of years the respondent had performed the task. Although Verizon contends that it would not have been feasible to stratify according to years of experience (Tr. 4, at 647-650), Verizon could have sought information about employees' experience.

However, according to Verizon's witness, the "service-cost analysts went to great lengths to obtain as large and as representative a sample as possible" and some stratification was included for CO size (id. at 642). According to Verizon, to "a certain extent, that was done through randomization, like at the [Regional CLEC Coordination Center ("RCCC")], where CLECs were chosen randomly" (id.). Verizon's witness explained further that in "the case of the CO frame, my understanding from the people who did administer the CO frame was that they took a variety of large, less-than-large, medium, less-than-medium, small COs and went out and got responses from them. I mean, the whole idea in statistics is to get a representative sample and as large a one as you can" (id. at 642-643). Verizon also indicated that the cost analyst "appeared . . . to have sensible sampling plans, and then carried them out" (id. at 643).

Although the cost analysts might have used other criteria for determining to whom to send the survey, Mr. Goldrick indicated that he was not specifically aware of them, nor is there any documentation as to any criteria that these cost analysts might have used in determining the sample except in the case of the RCCCs where "technicians were -- or coordinators were randomly selected, taken off line for a certain amount of time to fill out the survey, and then sent back to work" (id. at 657).

The survey sampled employees throughout Bell Atlantic's 14-state region (id. at 620). Contrary to the CLEC Coalition's concern, Verizon's reliance on data from throughout Bell Atlantic's region is reasonable because there is no evidence to suggest that tasks differ depending upon the state in which they are performed. A more likely source of variation in task time would be the rural, suburban, or urban location of the activities, which could affect the cost of field dispatch and travel. Verizon attempted to obtain data from COs of varying sizes, which addresses this concern, although it did not provide any documentation that demonstrates how it ensured representative sampling based on this attribute (see id. at 642).

By involving a statistician in the survey, Verizon enhanced the validity of its sampling process. However, as discussed above, Verizon could have demonstrated better that it obtained random samples that represented the critical attributes of the larger population, such as CO size, complexity of task, and relative experience of the survey respondents. The last time that Verizon surveyed its employees, in 1996, it had provisioned only 240 UNE loops; by comparison, as of December 2000, it had provisioned over 75,000 UNE loops in Massachusetts and over 680,000 UNE loops in the Verizon-East jurisdictions (Exh. VZ-14, at 6). This substantial increase in the volume of UNE loops provisioned since Verizon last submitted a task-time based NRC study means that the degree to which Verizon succeeded in obtaining representative samples has become vastly more important than it was in 1998. With the modifications directed below, which are intended to address some weaknesses in Verizon's survey methodology, we approve Verizon's estimates of the time necessary, in today's environment, to complete UNE-related tasks.

We now turn to the issue of precision. The dispersion of the sample data provides information about the level of precision of the estimates obtained by the sample. Verizon's response to RR-DTE-13 provides information about the dispersion around the mean task time of the samples conducted, i.e., the standard error (or the estimated standard error), and, in some instances, shows wide dispersion. However, according to Verizon, a more meaningful analysis is included in Verizon's response to RR-DTE-14, in which Verizon analyzes the dispersion of the cost results for the various UNEs rather than the dispersion of the task times. Verizon refers to its analyses as "precision tests." For example, the interval for the Two Wire

New Initial NRC ranges from a low-end of $176.80 to a high-end of $194.64.[175] The confidence intervals for the various UNEs range from ± 3.4 percent to ± 40.9 percent.[176] Because we are making other changes that affect the NRC calculations, the statistical analysis presented in RR-DTE-14 is irrelevant.

Our other directives will not affect Verizon's data on task times, however, and therefore we will turn to these data in order to remedy the weaknesses in Verizon's survey methodology. As discussed in detail above, although Verizon made a good faith effort to conduct a statistically sound survey, it was unable to substantiate the criteria it used to obtain a random, representative sample. Furthermore, although Verizon indicates that it obtained responses from urban, suburban, and rural environments, it was unable to demonstrate how it ensured that the sample was representative of the population (Verizon Reply Brief at 208). If Verizon surveyed employees in certain CO sizes, or employees with certain levels of experience disproportionately, the results will not be representative. For example, in explaining the wide variation in task time responses, Verizon indicates that some engineers may take two minutes in a small rural wire center to perform a certain task, while in a large metropolitan area, with complex cable, the same task could take three hours (id. at 210, n.192). This wide variation underscores the significance of the sampling technique. If Verizon's sample included a disproportionate quantity of complex tasks, the resulting costs

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175 This interval is calculated by subtracting 4.8 percent of $185.72 (i.e., $8.92) from $185.72, and adding 4.8 percent of $185.72 (i.e., $8.92) to $185.72.

176 See Exh. RR-DTE-14, Att. 1, UNE Number 32 Expedited and UNE Number 9 Expedited.

would be overstated. The way in which samples are obtained affects the accuracy of the results.[177]

Therefore, we direct Verizon to compute a 95 percent confidence interval around each of the task times, meaning that with 95 percent confidence, the true mean of the population would be within the interval computed, and Verizon should submit these calculations (see RR-DTE-13). If the survey were not flawed, the sample mean would clearly be the best estimator of the population. However, having found flaws, we direct Verizon to use instead the low end of the 95 percent confidence interval for the task times that it uses in its NRCM to account for these flaws.

E. Forward-Looking Adjustment Factors and Typical Occurrence Factors

1. Overview

Verizon applies a TOF and a Forward-Looking Adjustment Factor ("FLAF") to its task time estimates. The TOF is a percentage used to discount the average time to reflect instances in which a task is not necessary for the provision of a UNE (Verizon Brief at 215). In other words, the TOF is the "percent of time the activity has to be performed in today's environment assuming the most efficient process" (Exh. VZ-37, exh. A at 6). For example, a TOF of 30 percent represents Verizon's view that a task is necessary in today's environment 30 percent of the time, while a TOF of 100 percent represents a position that the task is always necessary. The FLAF purports to account for expectations regarding forward-looking improvements stemming from increased mechanization and/or improved processes (Verizon Brief at 215).

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177 See Stuart, The Ideas of Sampling at 23.

The FLAF is the "percent of time the activity is estimated to be performed in the future assuming the best attainable OSS level of improvement" (Exh. VZ-37, exh. A at 6).

2. Positions of the Parties

a. Verizon

Verizon states that its NRCM is "forward-looking because it seeks to measure the non-recurring costs that Verizon truly expects to incur in the future as it efficiently expands and replaces its network over time" (Verizon Brief at 222). Verizon adjusts its task time survey responses by applying the TOF and the FLAF (id. at 215). Only after Verizon applies the FLAF does Verizon consider its work time estimates forward-looking. Verizon explains that these factors were determined by a panel of SMEs who "were well-versed and aware of projected work-process and system improvements coming down the pike, and they embedded that knowledge into an estimate of how much time it would take to do that task in a forward-looking network" (id. at 223, citing Tr. 3, at 509). Verizon's forward-looking adjustments are based on currently available technology, which Verizon claims is appropriate (id. at 223, citing 47 C.F.R. § 51.505).

Countering AT&T's criticism of its forward-looking adjustments, Verizon states that "Verizon's experts (who themselves have provisioned UNEs or managed workers who do) utilized the work times from the surveys as a baseline for their adjustments, enabling them to make realistic and supportable judgments concerning how work times (and the frequency of activities) would change in the future" (Verizon Reply Brief at 207).

b. AT&T

AT&T claims that Verizon fails to offer documentation or explanation for its FLAF (AT&T Brief at 259). AT&T states that Verizon offers no rationale to support its decision whether to apply a FLAF and what percentage to apply for each individual task (id.). AT&T further argues that it is unclear whether Verizon's FLAF "reflects a forward-looking reduction in the time needed to perform a task or a reduction in the occurrences of that task or some unspecified combination of both" (id. at 259-260). AT&T concludes that Verizon has not met its burden of proof, rendering the final results of Verizon's work time estimates arbitrary and unsupported (id. at 260).

AT&T refers to Verizon's FLAF as "mysterious and unexplained" (AT&T Reply Brief at 173). According to AT&T, the "fundamental flaw in Verizon's survey approach is that Verizon completely failed to establish that the tasks it decided to measure in 1999 reflect the efficient and forward-looking processes required by TELRIC" (id.). AT&T argues further that Verizon's criticisms of AT&T's work times are inappropriate because Verizon has itself failed to provide evidence of the forward-looking adjustments upon which its NRCs are based (id.).

3. Analysis and Findings

The FLAF is a critical component of Verizon's NRCM because without this adjustment to the task time estimates, Verizon's NRCM would compute today's costs. The FLAF incorporates adjustments for reductions in task times and for occurrence factors (Tr. 3, at 510-511, 521-522). In a forward-looking environment, particular tasks may require less time and may occur with less frequency. Verizon did not provide any documentation explaining the basis of the particular adjustments it proposes (id. at 511, 527-528).

Verizon explains that the FLAF is the percent "frequency with which an activity is expected to be done, if at all, for a given UNE in the forward-looking period" (Exh. VZ-14, at 12). The application of an FLAF that accounts for expectations regarding forward-looking improvements stemming from increased mechanization and/or improved processes is appropriate in a forward-looking TELRIC-compliant study. Verizon's failure to incorporate any forward-looking adjustments in its cost study in the previous proceeding is appropriately addressed by the application of FLAFs in this proceeding. See Phase 4-L Order at 6-27.

AT&T's overarching concern about the lack of any backup documentation to support Verizon's FLAF, however, has merit. Verizon has the burden to provide evidence to support its FLAF. In response to a question during the evidentiary hearings, Verizon was only able to provide a general description of the process it used for determining the FLAF:

> Not to my knowledge is there evidence presented herein to back up the numerics of the forward-looking-adjustment factors. My colleagues on this panel of experts came into the room, sat down with service-cost folks, used their knowledge of what was coming up in their part of the business as far out as they could see at that time, and made judgments on how the work was going to be impacted, both from a standpoint of the requirement for manual work, what percentages of the time, and the actual time frame that the task took [Tr. 4, at 581].

The FLAF is a subjective prediction of forward-looking efficiencies, which AT&T recognizes: "[s]etting rates on the basis of a forward-looking network necessarily requires analyses that include educated estimates of what effect future processes and technology will have upon nonrecurring costs" (AT&T Reply Brief at 174). The subjective nature of this process highlights the real limitations intrinsic in forward-looking assumptions and predictions.

As we found in relation to the task times in Consolidated Arbitrations, "there is a strong likelihood of bias when employees are instructed to provide estimates that they are told will be used to derive charges for their employer's competitors." See Phase 4-L Order at 25. The same principle holds true with regard to Verizon's proposed FLAF derived from the subjective opinions of its own SMEs. An incentive exists for Verizon's SMEs to overstate the FLAF so as to inflate the resulting NRCs. As a result, the Department finds that Verizon's proposed NRCs should be adjusted downward in an effort to alleviate this bias.

The FLAF incorporates two categories of adjustments for the following: in a forward-looking environment, the probability of a task occurring may decrease, thus lowering the TOF and also, forward-looking practices could reduce the amount of time necessary to complete the task (Tr. 3, at 510-511, 521-522). These task-specific FLAFs are based on Verizon's judgment, and Verizon does not document their derivation.

Our evaluation of the record leads us to conclude that some reduction in the FLAF is necessary, but it is impossible to find specific quantification for that reduction in the record (Tr. 4, at 581). The Department is thus left with the necessity of using its expert judgment to determine an appropriate percentage reduction. Our judgment applied to the record in this case results in a finding that Verizon shall decrease its FLAF by 20 percent across the board. Because the FLAF is an integral component of Verizon's calculation of the forward-looking cost of all tasks in the NRCM, and because Verizon bases all its proposed FLAFs on the same unsubstantiated proposed methodology, the 20 percent adjustment shall apply to all tasks. Verizon proposes FLAFs ranging between zero percent and 100 percent (Tr. 3, at 511, 527-528; Tr. 4, at 581). A FLAF of zero means that the task will not occur in a forward-looking environment, whereas a FLAF of 100 percent means that the forward-looking task time will be identical to the present task time. The 20 percent adjustment corrects the bias inherent in

Verizon's estimates of FLAFs and also recognizes that processes will become more efficient in the future. Thus, for example, where Verizon proposes a FLAF of 60 percent, it should instead use a FLAF of 48 percent. The burden of proof falls upon Verizon to demonstrate the reasonableness of its cost estimates, and thus, in the aspects of its study where it has not done so we seek to address the greater likelihood that Verizon's methodology overestimates rather than underestimates costs.

Although this section addresses the FLAF, one issue regarding one of Verizon's proposed TOFs merits mention. Verizon based its original proposed TOF for technician travel on the percentage of unstaffed COs (Tr. 4, at 742). Subsequently, in response to RR-DTE-21, Verizon indicated that it "believes that the cost driver for the percent of UNE orders that will require technician travel time is more appropriately captured by the number of lines located in unstaffed central offices" (RR-DTE-21). We concur with Verizon that the number of lines is a more accurate indicator of the probability of the need for technician travel and thus Verizon's compliance filing shall include this modification.

F. OSS Efficiency: Manual Intervention and Fallout

1. Overview

Fallout is generally defined as the failure of an order that is designed to flow through OSS to do so properly. The parties propose different fallout rates for the processes involved with service order and service provisioning of UNEs. The service order process is the process by which CLECs order particular UNEs from Verizon, while the service provisioning process is the process by which Verizon actually installs and activates those UNEs.

2. Positions of the Parties

a. Verizon

Verizon proposes forward-looking fallout rates with the assumption that some manual processing is necessary for certain types of complex and/or low-volume orders and states that an "accurate non-recurring model must account for such manual handling by design, which is distinct from error-related fallout" (Verizon Brief at 225). Verizon offers in support of its position that it "would be neither cost-effective nor, in some cases, even possible, given currently available technologies, for Verizon MA to mechanize the handling of every type of order" (id.).

Verizon explains that fallout occurs at the ordering stage of provisioning UNEs in two specific occasions. First, as explained above, certain complex and/or low-volume orders are designed to fallout. Second, a CLEC order that contains a "logical error," one that contains proper format, but incompatible information, also will fallout (id. at 226). Most formatting errors, however, will be returned to the CLEC automatically without manual intervention (id.). Verizon therefore asks the Department to approve its NRCM as it relates to the ordering process and argues that "Verizon MA has assumed a realistic forward-looking ordering environment in which orders that should be processed by automated systems are so processed, and in which 'fallout' – that is, the failure of the an order that is designed to flow through the system to do so – is minimized" (id. at 227) (emphasis in original).

Verizon explains its decision to include costs of certain functional organizations such as the MLAC, the Recent Change Memory Administration Center ("RCMAC"), the Circuit Provisioning Center ("CPC"), and the RCCC as "a vital part of the provisioning process, even in a forward-looking environment" (id. at 229). Verizon states that in the event of order errors at the provisioning stage, "Verizon will typically correct the information on the order, not the information in the database" and explains further that the "charges for these event-driven corrections are properly billed on a non-recurring basis" (id. at 231). Verizon therefore insists that, "[l]ike Verizon MA's ordering-related non-recurring charges, Verizon MA's provisioning-related charges are appropriate and should be adopted" (id. at 227).

Verizon contends that AT&T and WorldCom cannot point to a system or carrier that surpasses the performance levels that Verizon's NRCM assumes (id. at 228). Verizon faults the CLECs' analysis because they "do not even purport to account for manual handling by design, even for the most complex orders" (id.). Verizon states that, contrary to AT&T and WorldCom's argument, Verizon does not assume a high incidence of database errors (id. at 231).

Verizon faults the CLECs for "wish[ing] away the vast majority of errors that must be addressed manually"; for assuming the "level of near perfection assumed by AT&T's model"; and for failing to recognize that automating all tasks would not be cost efficient (Verizon Reply Brief at 196-197). Verizon argues that AT&T's position that Verizon could automate orders of five or more lines is without merit because manual processing of orders accommodates retail and wholesale customers who recommend that Verizon conduct a facilities check before generating a firm order confirmation for large orders (id. at 198-199). Verizon further argues that, unlike the CLECs, its "ordering costs are based on real-world evidence of how much time [TISOC] activities involve" (id. at 199-200).

b. AT&T

AT&T states "the forward-looking requirement of the TELRIC methodology also mandates that NRCs be based on the assumption that CLECs and ILECs will conduct their business electronically using efficient OSSs" (AT&T Brief at 250). AT&T alleges that Verizon assumes excess manual intervention and coordination in the ordering and provisioning stages of providing UNEs (id.).

AT&T proposes, at the service ordering stage, a fully automated zero percent fallout assumption in its calculation of NRCs. According to AT&T, "when an OSS system is functioning properly there should be no human intervention required to process CLEC service orders" (id. at 251). AT&T recommends that the OSS automatically return defective orders back to the CLEC for correction without imposing a service order charge (id.). Although Verizon has designed its current system to process complex and/or low-volume orders manually, AT&T states that such a decision "should not be the basis for establishing proper forward looking NRCs" (id. at 252).

Unlike at the service ordering stage, AT&T acknowledges that some orders will require manual intervention at the provisioning stage even in a forward-looking environment and therefore proposes a provisioning stage fallout rate of two percent in calculating NRCs (id.). AT&T assumes that only CLEC-caused fallout is included in this two percent rate because it argues that ILEC-caused fallout is more appropriately recovered as a network maintenance recurring cost (id. at 252-253). In further support of its position, AT&T refers to the Department's finding in Consolidated Arbitrations that ordered Verizon to use two percent fallout for its calculation of NRCs, and also claims that continuing to use a two percent fallout rate will serve as an incentive for Verizon to further automate its provisioning processes (id. at 253-254).

AT&T faults Verizon for ignoring "the processing efficiencies that modern OSSs offer" (AT&T Reply Brief at 166). Countering Verizon's claim, AT&T asserts that Verizon's contention that manual processing is the most economical option for certain CLEC orders is unsupported (id. at 167). In response to Verizon's claim that no ILEC has deployed a processing system with 100 percent automation, AT&T makes the following three arguments: (1) the Department should determine costs based on a forward-looking network rather than what exists today; (2) ILECs lack a market incentive to deploy more efficient processes; and (3) Verizon uses more efficient, automated processes when it handles its own service orders (id.).

AT&T also refutes Verizon's assumption that CLECs have demanded manual intervention for complex orders and explains that CLECs simply want assurance that facilities will be available (id.). Instead of performing a manual check to confirm the availability of facilities, AT&T argues that Verizon should assume the existence of efficient OSSs that can provide the requisite information efficiently (id.).

AT&T also observes that when Verizon first filed its NRC cost studies in 1997 it assumed a 15 percent fallout rate and that in this proceeding, it acknowledged that a fallout rate as low as four percent is achievable (id. at 169). This trend, according to AT&T, thus demonstrates the reasonableness of the Department's continued use of the two percent fallout rate adopted in the Consolidated Arbitrations proceeding (id.).

c. WorldCom

WorldCom contends that Verizon's manual handling of orders is inefficient and would be unnecessary were appropriate systems developed (WorldCom Reply Brief at 63). According to WorldCom, Verizon ignores the "assumption in TELRIC pricing of a forward-looking network built from scratch" (id., citing Rhode Island 271 Order). WorldCom disputes Verizon's claim that Verizon's embedded OSSs are as efficient as possible (id. at 63). In reference to the provisioning of orders, WorldCom further explains this position:

> But what makes Verizon's manual process 'necessary' today is that its OSS is incapable of handling these 'complex' orders. What makes the process 'efficient' today, from Verizon's perspective, is the circular reasoning that the process is efficient because that is the way Verizon's systems were designed, and Verizon's systems were designed this way because it is efficient. In sum, Verizon positions this system deficiency as being a design decision. But that only begs the question of why the system could not be designed to handle these orders electronically. The answer, of course, is that a new entrant, seeking to maximize efficiency for the sake of its CLEC customers, would design a system capable of handling 'special of complex' CLEC requests (id. at 62).

WorldCom therefore concludes that, "because Verizon's approach is fundamentally at odds with TELRIC, its costs are largely based on tasks that would be minimized or eliminated altogether in a truly forward-looking network" (id. at 63).

WorldCom proposes that fallout from the ordering process not exceed two percent in a forward-looking network, assuming efficient use of OSS (WorldCom Brief at 72). WorldCom states that "the resolution of orders with CLEC-caused errors in format or content should be the rejection of the orders back to the CLEC by Verizon's OSS" rather than assuming "too high a level of manual intervention in the service ordering process" (id.).

At the provisioning process stage, WorldCom proposes a fallout rate of two percent (id. at 73). According to WorldCom, an efficient use of OSS should limit the amount of manual intervention through the automatic return of errors back to the CLEC, and it explains that if "the order does not contain errors, then the assignment of facilities should in almost all cases be done by an OSS programmed to pick the most appropriate facilities" (id. at 72-73). As a result, WorldCom suggests that Verizon inflated its NRCs with too much manual intervention such as in the case of the significant role of the MLAC (id. at 73).

d. CLEC Coalition

The CLEC Coalition claims that Verizon's NRCs are inflated due to excess manual intervention resulting from a failure to model costs assuming an enhanced and efficient OSS (CLEC Coalition Brief at 108). One example that the CLEC Coalition raises is a Verizon-proposed manual response to CLEC orders that contain errors. According to the CLEC Coalition, "this is not how a forward-looking OSS would operate, nor is it consistent with how Verizon's OSS actually functions. In a forward-looking OSS the order would be automatically sent back to the CLEC with an appropriate error message for correction" (id. at 110). A second example is what the CLEC Coalition considers "significant intervention on the part of workgroups" such as the MLAC, CPC, RCMAC, and RCCC in the facility assignment process (id.). Although these workgroups are representative of current Verizon processes, the CLEC Coalition claims that Verizon fails to demonstrate that "its present experience is reflective of what would occur with an efficient, forward-looking OSS" (id. at 111). More specifically, "the work of the RCCC is redundant in that an efficient OSS would obviate the need for many of the task that the RCCC undertakes" (id. at 112). Third, the CLEC Coalition disagrees with Verizon that complex orders require manual intervention and a fallout rate of nearly 100 percent since such a rate fails to reflect an efficient OSS (id. at 111). The CLEC

Coalition therefore supports the Department's previous finding in Consolidated Arbitrations of a two percent fallout rate (id. at 113, citing Phase 4-L Order at 16). As a result, the CLEC Coalition also proposes that the Department direct Verizon to modify RCCC costs to reflect a lower activity consistent with a two percent fallout rate (id. at 112).

3. Analysis and Findings

The Department's finding in Consolidated Arbitrations is clear: "We therefore conclude that the two percent fallout rate offered by the CLECs is indicative of likely experience with forward-looking technologies in this industry." Phase 4-L Order at 16. The Department reached this conclusion when Verizon's actual MLAC fallout rate was 15 percent. The rate at which orders fall out has been reduced since then to ten percent, and Verizon considers a fallout of four percent to be achievable (Exh. VZ-16, at 8; Tr. 3, at 532). This trend strengthens confidence in the Department's previous finding and indicates that technological improvements affecting fallout are attainable.

While Verizon has yet to achieve a fallout rate of two percent as set in the past UNE proceeding, our earlier finding continues to be applicable: "we are unpersuaded of the utility of a fallout figure based on the [Verizon] legacy retail order systems as representative of state-of-the-art OSS installed to process CLEC orders." Phase 4-L Order at 16. The forward-looking fallout rate must assume a dropped-in-place state-of-the-art OSS technology, not an OSS methodology evolved from Verizon's legacy systems. Verizon's proposed forward-looking fallout rate is saddled by an overly-manual process as a result of Verizon's incorporation of its current design and processes. The Department continues to view CLECs as "sophisticated telecommunications carriers, who have every commercial interest in presenting service order information to [Verizon] electronically on a schedule, in a format, and with such accuracy designed to achieve the highest possible level of flow-through." Phase 4-L Order at 11. Verizon fails to persuade the Department to alter its previous finding that a two percent fallout rate is indicative of likely experience with forward-looking technologies in this industry. The Department therefore orders Verizon to modify its NRCM to assume a global fallout rate of two percent.

G. Upfront Disconnect Costs

1. Overview

Verizon includes disconnection costs among the NRCs associated with the wholesale provisioning of UNEs. Upfront disconnection costs are common practice in the retail arena. The issue surrounding disconnection cost is not whether such costs should be estimated and charged to CLECs. The issue is whether the CLEC which has ordered a service should be charged for disconnection of that service at the time service is ordered or upon disconnection. Verizon, in parallel with its policies and Department-approved NRCs for retail customers, has proposed including these charges in the wholesale service ordering rate element. AT&T, WorldCom, and the CLEC Coalition argue that this policy is inappropriate when it comes to CLECs, and they instead propose that disconnect charges be recovered at the time disconnect occurs, pursuant to TELRIC-compliant cost causation principles.

2. Positions of the Parties

a. Verizon

Verizon proposes to recover disconnection costs upfront as part of its non-recurring rates associated with the provisioning of a CLEC's unbundled service. The disconnect costs are discounted based on a 12.6 percent cost of capital and a 2.5 year forecasted life to account for the time value of money. According to Verizon, "[t]his approach represents the industry norm, is entirely reasonable, and should be approved by the Department" (Verizon Brief at 235). Verizon offers two arguments to support this conclusion. First, Verizon claims that an upfront disconnect cost is necessary to ensure that the appropriate cost-causer bears the financial responsibility for the costs it produces (id.). Second, Verizon argues that recovering disconnect costs at the time of disconnection would burden ILECs with the unfair risk of non-recovery due to financial troubles or other reasons (id.).

Verizon states that CLECs erroneously claim that combining disconnection costs with connection costs is unfair because some services may never be disconnected (Verizon Reply Brief at 220). Verizon explains that every service that is connected will one day be disconnected and that therefore imposing a disconnect charge when a service is ordered will ensure that Verizon recovers its costs, particularly from those CLECs that are not financially stable (id.).

b. AT&T

AT&T contends that the CLEC market is very different from the retail market and that Verizon's proposal raises the barrier to competitive entry (AT&T Brief at 264-265). Furthermore, AT&T argues that even if the CLEC customer discontinues service from the CLEC, the physical connection may not actually be disconnected but rather may be left in place to benefit Verizon or another CLEC (id. at 265).

AT&T states that CLECs are not typical retail customers and therefore, "Verizon should have no difficulty tracking down corporate CLECs and collecting from them in an efficient and cost-effective manner" (id. at 266). Also, AT&T states that upfront disconnect costs violate basic economic principles of cost causation because "disconnect charges should be imposed only if and when disconnect occurs" (id.). As AT&T emphasizes, "[u]nless and until there is a disconnection, no cost has been 'caused' at all. If disconnection never occurs, no cost will ever be 'caused.' Imposing such an artificial cost on a CLEC as a condition of entering the market is completely inconsistent with the TELRIC pricing standard" (AT&T Reply Brief at 175-176). Also, AT&T observes that Verizon's own witnesses could not recall any CLEC going bankrupt in Massachusetts, which, according to AT&T, undermines the credibility of Verizon's concern about the risk of recovering disconnect costs.

c. WorldCom

WorldCom views Verizon's upfront disconnect charges as an inappropriate inflation of Verizon's proposed NRCs: "This violates fundamental principles of cost causation and serves only to inflate the charges CLECs must pay in order to enter the market" (WorldCom Brief at 74).

d. CLEC Coalition

The CLEC Coalition argues that Verizon's proposed NRCs are artificially inflated by the inclusion of upfront disconnect costs (CLEC Coalition Brief at 115). As a result, the CLEC Coalition claims that, "assessing disconnect costs on an up-front basis amounts to an entry fee and constitutes a barrier to entry to CLECs" (id. at 117). The CLEC Coalition proposes as a remedy that, "these upfront costs [ ] be removed . . . because Verizon should only receive the revenue for disconnection at the time the actual disconnection occurs, if disconnection occurs at all" (id. at 116) (emphasis in original).

In support of its position against upfront disconnect costs, the CLEC Coalition cites favorable decisions from public utility commissions in Florida, Connecticut, California, New Hampshire, and Maine (id.). The CLEC Coalition also stresses that upfront disconnect costs are inappropriate because of future uncertainties regarding disconnection, explaining that "there is no way of knowing whether disconnection will ever occur at the time service is provided" (id. at 117). The CLEC Coalition therefore criticizes Verizon's 2.5 year assumption for the present value calculation of its proposed upfront disconnect costs (id.). The CLEC Coalition further states that upfront disconnect costs fail to incorporate potential cost savings related to technological improvements (id. at 116).

3. Analysis and Findings

Verizon computes disconnect costs separately, discounts them based on a 2.5-year forecast life, and adds these costs to the connect costs to derive the proposed total NRCs (Exh. VZ-14, at 12-13). Verizon continues to be entitled to a reasonable assurance that disconnect costs will be recovered from its retail and wholesale customers. See Phase 4-L Order at 22. The parties fail to persuade the Department that a CLEC would be more able and willing to pay disconnection costs than retail customers. AT&T acknowledges that a risk exists that disconnect charges might not be recovered from CLECs in the future (Tr. 5, at 856-857). Therefore, the Department finds that Verizon's recovery of these upfront disconnect costs continues to be appropriate. The Department will "maintain our longstanding policy of including disconnection costs in the calculation of installation NRCs." Phase 4-L Order at 21.

In future proceedings, however, Verizon should substantiate better its estimate of the average life of the UNE loop.[178]

H. Hot Cuts

1. Overview

The hot cut process involves the loop provisioning conversion from one LEC to another. Verizon proposes hot cut NRCs that it presents as appropriately forward-looking. AT&T, the CLEC Coalition, and XO oppose Verizon's proposed UNE-L hot cut NRCs on the grounds that the charges are excessive, not cost-based, would cause a competitive barrier to entry, and would stifle competition in Massachusetts.

2. Positions of the Parties

a. Verizon

Verizon explains that many of the costs associated with its proposed hot cuts are included as a result of requests by CLECs during industry meetings and the New York Section 271 collaborative (Verizon Brief at 236). Verizon states that although AT&T recommends a more automated hot cut process in a multi-LEC environment, "the hotcut procedures in place today are labor-intensive, and could not be replicated by any mechanized process" (id. at 237). Verizon states that a hot cut "requires the involvement of various Verizon organizations and, importantly, precise coordination with the CLEC" and that the "RCCC is responsible for ensuring that a loop is simultaneously disconnected from Verizon MA and connected with the CLEC's facilities so as to minimize interruption of service to the end user" (id. at 230).

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178 Verizon indicates that the information supporting the 2.5 year life "was generated prior to the first UNE proceeding in 1997 and is no longer available" (RR-DTE-16).

Although AT&T contends that Verizon's proposed pre-cutover visit to verify dial tone at the CLEC port is unnecessary in a forward-looking environment, Verizon cites the FCC's observation that such a visit "appears to be critical to the proper functioning of the hot cut process" (id. at 238, citing New York 271 Order[179] at ¶ 186). Verizon emphasizes the importance of a seamless hot cut process to the wholesale provisioning of UNEs: "The ability of a BOC to provision working, trouble-free loops through hot cuts is of critical importance in view of the substantial risk that a defective cut will result in end-user customers experiencing service disruptions that continue for more than a brief period" (id. at 237, citing New York 271 Order at ¶ 299).

Verizon states that the coordination efforts that are the focus of the CLECs' criticism "exist as a result of their requests and ensure that end-user customers are not left without service" (Verizon Reply Brief at 200). Verizon explains further that the coordination tasks may be more time-consuming than the actual physical work (id. at 201). According to Verizon, the CLECs "have identified no new automated systems that could perform the multiple coordination activities in which Verizon MA engages to perform trouble-free hotcuts" (id. at 203).

b. AT&T

AT&T colorfully characterizes as "outrageous" and "mind-boggling" Verizon's proposed increase from the existing nonrecurring cost which ranges between $86.01 and

179 In the Matter of Application by Bell Atlantic New York for Authorization Under Section 271 of the Communications Act to Provide In-Region InterLATA Service in the State of New York, CC Docket no. 99-295, Memorandum Opinion and Order, FCC 99-404 (rel. December 22, 1999) ("New York 271 Order").

$98.66 for local loops to $307.34 for a two-wire hot cut initial with field dispatch (AT&T Brief at 234). AT&T claims that such a cost would stifle local exchange competition, serve as a barrier to competitive entry, discourage CLEC investment in their own switches, and encourage CLECs to rely solely on UNE-P and to avoid all UNE-L orders (id. at 235). AT&T attributes Verizon's excessive hot cut costs to a judgment that Verizon's NRCs are not appropriately forward-looking and that the NRCs include costs for activities that are or should be recovered through recurring charges (id. at 235-236). Mr. Walsh testified that, if "both companies [involved in the hotcut] act as indicated on the order, the customer will be migrated seamlessly and without inordinately expensive manual labor. There is no reason to involve the RCCC in an automated, efficient process" (Exh. ATT-14, at 48).

AT&T, therefore, proposes that the Department modify all eight NRCs for UNE-L hot cuts to an across-the-board rate of $35.00 (AT&T Reply Brief at 15).[180] According to AT&T, "there is no reason why the Massachusetts hot cut rate should exceed the $35 level set now in both New York and New Jersey" (id. at 17). AT&T states that Verizon was "forced to withdraw its 271 application [in New Jersey], and to reduce its hot cut charges to the same $35 level that was recently agreed to by Verizon-NY" (id.).

c. CLEC Coalition

The CLEC Coalition argues that Verizon's NRCs for UNE-L hot cuts are exorbitant, cost prohibitive, and constitute a barrier to competitive entry (CLEC Coalition Brief at 120; CLEC Coalition Reply Brief at 10). According to the CLEC Coalition, "[t]he migration

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180 The eight UNE-L hot cut costs at issue are Two Wire Initial, Two Wire Additional, Four Wire Initial, Four Wire Additional, IDLC to Copper New, IDLC to Copper Additional, Line Port New, and Line Port Additional.

process for loops should reflect an efficient cost-effective process," but instead, the process includes "many 'inefficient, redundant and time consuming manual tasks'" (CLEC Coalition Brief at 121, citing Exh. ATT-14, at 44-45). The CLEC Coalition claims that Verizon-proposed costs for hot cuts are high due to an excessive labor-intensive process controlled by the RCCC (id. at 121-122). While Verizon suggests that CLECs have demanded in industry meetings and Section 271 proceedings the protracted hot cut procedures that inflate hot cut rates, the CLEC Coalition claims that "CLECs have had to request these procedures to get Verizon to perform hot cuts properly" (CLEC Coalition Reply Brief at 9). The CLEC Coalition argues that this situation is analogous to a cooperative testing decision in the D.T.E. 98-57 Phase III Order in which the Department found that CLECs should not be forced to pay higher costs for Verizon's poor provisioning (id. at 9-10). The CLEC Coalition contends that, similarly, CLECs "should not be forced to pay higher charges for Verizon's poor provisioning of hot cuts" (id.).

The CLEC Coalition objects to Verizon's proposed migration charge for customers on IDLC facilities prior to a hot cut to migrate to copper facilities (CLEC Coalition Brief at 123). The CLEC Coalition asks the Department to require Verizon to reformulate its hot cut migration model to be more automated and efficient (id. at 124). The CLEC Coalition proposes that, "[a]t the very least," the Department "reject Verizon's proposed costs for RCCC coordination activity for hotcuts" because, according to the CLEC Coalition, where "some effort is required to perform work in accordance with an integrated schedule, that effort should be considered integral to the obligation of each company" (id.). The CLEC Coalition also recommends that the Department require Verizon to adopt in Massachusetts the $35.00

hot cut NRCs it agreed to in New York[181] and argues that otherwise, the hot cut loop rates will be "drastically higher than in New York" (id. at 125).

The CLEC Coalition describes SBC's two hot cut processes, one of which is a fully coordinated hot cut process involving manual processing and more coordination and communication between the CLEC and SBC. The other hot cut is performed during normal business hours without manual intervention. According to the CLEC Coalition, the FCC describes that as offering CLECs "their choice of two alternative processes in every case, allowing them to pick the process that best fits their resources and priorities" (CLEC Coalition Reply Brief at 10, citing SBC Texas 271 Agreement, Appendix Pricing UNE at 1, 10).

d. XO

XO emphasizes the importance of the hot cut process for the continued development of local exchange competition (XO Brief at 1). XO describes Verizon's proposed costs for hot cuts as anti-competitive, a price squeeze, and not in the public interest (id. at 2-4). XO states that if the Department approves Verizon's proposed costs for hot cuts, "XO will be forced to review its plans in Massachusetts and decide whether it can afford to remain active in the Commonwealth" (id. at 3).

3. Analysis and Findings

Verizon presently charges an identical rate for hot cut orders (i.e., orders where Verizon converts a customer from one network to a UNE loop that is served by another carrier's switch) and for new initial UNE loops (i.e., orders for new service that therefore do

181 The rates in New York consist of a $35.00 non-recurring charge for two-wire and four-wire hot cuts, which include service order charges, central office charges, and provisioning charges.

not require a customer's existing telephone service to be converted from one carrier to another carrier) (see Tariff 17, Part M, Section 1). In this proceeding, Verizon proposes to deaverage hot cut and new initial orders, and proposes hot cut costs that exceed those for new initial orders (Exh. VZ-19). Verizon proposes NRCs for a two wire initial hot cut that include a service order NRC of $7.04, a CO wiring NRC of $68.24, and a provisioning NRC of $127.14 for a total cost, without field installation or manual surcharge, of $202.42 (id.). By comparison, Verizon proposes costs for a two wire initial new UNE loop that include a service order NRC of $7.04, a CO wiring NRC of $37.24, and a provisioning NRC of $23.27 for a total cost, without field installation or manual surcharge, of $67.55 (id.). The Department finds Verizon's proposal to deaverage hot cut and initial orders reasonable because it better aligns rates with the underlying costs.

Coordinated migration (or hot cuts) is essential to the development of local competition because it enables customers to switch carriers with minimal service disruption. We concur with the CLEC Coalition that Verizon and CLECs should have as a basic business priority the goal of minimizing service disruption to customers. Verizon proposes hot cut NRCs (excluding field dispatch costs) for eight different types of orders ranging between $148.02 and $233.70, including a proposed $202.42 nonrecurring cost for a two-wire initial hot cut loop (Exh. VZ-21). By comparison, in seeking Section 271 approval, Verizon's hot cut nonrecurring cost for all eight types of orders is $35.00 in New Jersey.[182]

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182 The Department of Justice raised a concern about whether Verizon's proposed hot cut NRCs in New Jersey would be transitory, stating "In addition to its assessment of whether Verizon's newly-reduced hot-cut NRCs are TELRIC-compliant, the Commission should also assure itself that Verizon's commitment will remain in place for a sufficient time to allow competitive entry" (footnote omitted). In the Matter Of

(continued . . .)

Verizon's hot cut costs in this proceeding are based on tasks that have evolved, in part, in response to CLEC requests (see Exh. VZ-18, at 42-43). When the Department asked whether AT&T uses or wants specific RCCC tasks related to hot cuts to conduct business in Massachusetts, AT&T responded:

> In sum, at present and under Verizon's current network environment AT&T does have a need for the activities referenced in the Department's request, which are all part of the current procedures for coordinated hot cuts. However, AT&T looks forward to the day when Verizon is able to ensure the accuracy of its line assignment data bases and update its provisioning practices to perform less costly, but no less accurate, uncoordinated hot cuts [Exh. RR-DTE 24].

The Department determined in Phase 4-L that:

> We accept Bell Atlantic's argument that the Coordination Bureau provides an important function in those cases requiring manual intervention. Indeed, we imagine that the absence of such a bureau would be quickly lamented by the CLECs if it did not exist to help with certain problems. Accordingly, the exclusion of all such costs in the NRCM is not warranted.

Phase 4-L Order at 29.

The Department upholds its earlier finding regarding the significance of the RCCC, although we caution Verizon against imposing a premium on CLECs to ensure that Verizon properly and accurately migrates customers. Thus, although, with few exceptions, we allow Verizon's tasks as they are delineated in its NRCM, we direct Verizon to make certain modifications to its development of forward-looking hot cut costs. If Verizon's hot cut cost

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(. . . continued)

Application by Verizon New Jersey Inc., Bell Atlantic Communications, Inc. (d/b/a Verizon Long Distance Company), NYNEX Long Distance Company (d/b/a Verizon Enterprise Solutions), Verizon Global Networks Inc., and Verizon Select Services Inc., for Authorization to Provide In-Region, InterLATA Services in New Jersey, WC Docket No. 02-67, at 5, Evaluation of the United States Department of Justice, April 15, 2002.

study fails to incorporate forward-looking assumptions sufficiently, then inappropriately high charges could impose a barrier to entry and, thus, could discourage the development of local competition within Massachusetts.

Other than the involvement of Andersen Consulting in the development of the TISOC component of the NRC costs, no independent consulting firm contributed to the development of Verizon's estimates of task times, task occurrence factors, or forward-looking adjustment factors (Tr. 4, at 558-559). The group of individuals who developed the FLAFs were all Verizon employees (id. at 578-579). Verizon does not have any back-up documentation for the FLAFs (id. at 581). The members of the panel that estimated the FLAFs were "asked not to constrain their thinking to any particular or arbitrary time frame, but to think of the most efficient environment that they could imagine or foresee at the time and to project their thinking out that far" (id. at 708). On the other hand, although the CLECs criticize Verizon's NRCM, they do not propose specific adjustments to Verizon's FLAFs, but rather propose different tasks and task times that they contend correspond better with the TELRIC requirements. Furthermore, they have not comprehensively modified Verizon's NRCM to incorporate all of their proposed changes, in part because, one "would have to change a lot of the task descriptions to suit the process that actually takes place" (Tr. 5, at 840-842).

Based on our review of Verizon's costs for this UNE and the record in this proceeding, we direct Verizon to adjust specific aspects of its hot cut cost study in order to make its study more forward-looking. Verizon shall apply these modifications to the relevant portions of the NRCM for other UNEs as well where applicable (i.e., where the same task is required to provide the other UNEs). Furthermore, where we direct changes to particular FLAFs for individual work group tasks, Verizon shall not also make the general FLAF adjustment that we discuss above. On the other hand, where we do not address specific FLAFs, Verizon shall apply these general adjustments. As we explain in Section III (Economic Issues), to the extent possible, we base our findings on actual evidence, witness expertise, our precedent, or persuasive analysis by other states or the FCC. However, where necessary and appropriate, we use our agency expertise and discretion to adjust parties' proposals.

Verizon calculates its hot cut costs by multiplying its estimate of the time necessary to complete required tasks in today's environment by today's TOF, and then Verizon multiplies that value by its proposed FLAF in order to compute the forward-looking cost for the tasks associated with providing various UNEs. In this section we specifically examine Verizon's FLAFs as they apply to hot cut orders. However, in its recalculation of hot cut costs, Verizon shall also incorporate the directive that we set forth in Section X.D that instructs Verizon to use the low end of the 95 percent confidence interval for the NRCM tasks times.

Verizon proposes service ordering, CO wiring, and provisioning costs of $7.04, $68.24 and $127.12, respectively (Exh. VZ-18, VMA_Whlsl_NRC_Wkpp_121701, Worksheet 3). Access to OSS affects the way in which Verizon and CLECs exchange information, the process by which CLECs submit requests for UNEs, and the process by which Verizon fulfills such requests, including providing CLECs with the acknowledgement of such requests and status reports (see Section XI.A (Access to OSS), above). We analyze the hot cut tasks in the context of our directive in Section X.F that requires Verizon to assume a state-of-the-art OSS system that is more efficient than that assumed by Verizon.

Service ordering includes the costs of tasks performed by the TISOC (Exh. VZ-14, at 16). Verizon includes forward-looking task time estimates for two TISOC tasks, task numbers 1 and 3. Verizon assumes a TOF of 38 percent for the TISOC task number 1 for a hot cut (and for other UNEs as well, including a new initial two-wire loop) and a FLAF of 61 percent, which yields an effective occurrence factor for this task of 23 percent. Verizon thus assumes that in a forward-looking environment, it will correct and process manually 23 percent of orders without returning them back to the CLEC (Exh. ATT-14, at 25; Exh. VZ-18).[183] Verizon describes this task as “Receive Local Service Request (LSR) from the CLEC and print, review, type and confirm the order request for new installation and/or account” (Exh. VZ-18). Verizon was unable to explain the basis of its proposed FLAF of 61 percent (Tr. 4, at 518-528). As AT&T indicates, CLECs have an incentive to eliminate the inefficiency associated with ordering, and Verizon’s study embeds an exaggerated estimate of future inefficiency. Verizon applies a 20 percent FLAF to the TISOC task number 3 (“respond and/or change CLEC's pending Local Service Request”), which yields an estimated forward-looking occurrence of approximately four percent. In Section X.F, we direct Verizon to assume OSS fallout of two percent. Accordingly, Verizon shall revise its cost calculations for these two TISOC tasks to be consistent with this directive.[184]

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183 The FLAF could alternatively be construed as reducing the task time, but not the occurrence of the task, or as reducing a combination of the task time and the probability of the task needing to occur.

184 This is an example of a directive that affects the cost calculation for other UNEs (e.g., two-wire, new initial).

The CO Frame Work Group completes the CO wiring, which entails the performance of the necessary functions, after an order is received, "to satisfy a CLEC request for service" (Exh. VZ-14, at 16). Task numbers 1 and 2 within the CO Frame Work Group concern the receipt, retrieval, and verification of information. Based on an expectation of a more automated forward-looking environment, we direct Verizon to apply a FLAF of 50 percent to these tasks, as opposed to Verizon's proposed FLAFs of 100 percent for these two tasks. The TOF for task 3, which includes travel to unstaffed central offices, shall be reduced as was discussed in more detail in Section X.E. Verizon assumes no efficiency gains in Task 15 ("load WFA tickets, check status of order activity, and report completion of order/frame work for WFA tickets (NDSUP and NDSUT) to the RCCC"). According to AT&T's witness, a more efficient hot cut process would not require this task (Exh. ATT-14, at 52). Contrary to AT&T's recommendation, we do not reject the inclusion of the task, however, we direct Verizon to apply a FLAF of 60 percent based on an expectation that Verizon can perform this step more efficiently in a more automated environment. CO Frame task numbers 17 and 18 involve work conducted in unison with field installation technicians. Based on our directives in Section X.C, these field work costs should be recovered in recurring costs and therefore, Verizon shall remove these tasks as well as any other field work-related tasks from the NRCM.

Provisioning includes the costs of tasks performed by the RCCC, the MLAC, and the RCMAC (Exh. VZ-14, at 16). Verizon assumes that the removal of "roadblocks"(RCCC task number 3) presently occurs 25 percent of the time, and estimates no change in the occurrence of this activity. Instead it should apply a FLAF of 50 percent to correspond with an expectation that Verizon, in a forward-looking environment, will require less time to remove "roadblocks" and that they will occur less frequently. Verizon applies a FLAF of 50 percent to the RCCC task number 6, "perform administrative checks." Assuming an efficient forward-looking environment, we find that a FLAF of 25 percent is more reasonable. Verizon makes no forward-looking adjustment to RCCC task numbers 18 and 19, which are to contact the CLEC to verify activity and to "schedule required Bell Atlantic work teams." Similarly, Verizon makes no forward-looking adjustments to RCCC task numbers 20 and 21, which entail verification and communication with CLECs. Activity verification, inter-carrier communication, and scheduling should become more automated in the future, and therefore, Verizon shall apply a FLAF of 50 percent to these four tasks. The goal of trouble-free migration of customers among carriers is essential but CLECs should not be required to pay a premium to obtain accurate service. Task number 33 entails internal notification about postponements, due date changes, and cancellations. Verizon shall apply a 60 percent FLAF based on the use of more automated systems. Similarly, Verizon estimates that task number 34, which involves the tracking of roadblocks and problems throughout the order, occurs 25 percent of the time now, and makes no FLAF. Based on expectations of more automated systems which should reduce the probability of roadblocks and the time necessary to resolve them, we direct a FLAF of 60 percent.

A 50 percent FLAF shall be applied to the one MLAC task, which is to "assign outside plant and central office facilities for non-flowthrough service orders" to be consistent with our OSS directives.

RCMAC is the third task group involved with service provisioning. Task number 1 is to "obtain direct notification from RCCC for UNE migration to colocation arrangement which requires the release of translation packets held in MARCH" and includes a 100 percent FLAF. Similarly, CO Frame task number 1 is to "receive notification from RCCC of pending hotcut." Verizon shall apply a 50 percent FLAF to both of these tasks because internal Verizon communications about hot cut orders should become more automated in the future.

Also, the general directive regarding adjustments to FLAFs shall apply to those tasks that we do not address specifically. Finally, the task time adjustment directed in Section X.D apply to all the task time estimates in the NRCM, including the hot cut tasks.

We note that, with the modifications directed herein, Verizon's NRCM will yield hot cut costs below those proposed by Verizon but that the costs will nonetheless likely significantly exceed the $35.00 charge that exists in certain other Verizon jurisdictions. This cost difference exists, in large part, because the hot cut process includes tasks that the CLECs have specifically requested in order to ensure trouble-free migration of customers from Verizon to other carriers. We realize that CLECs have also specifically criticized the magnitude of Verizon's proposed hot cut cost. Therefore, in addition to incorporating the Department-directed adjustments to the NRCM, we direct Verizon to examine carefully the components of the hot cut process and to develop a less costly alternative for CLECs that Verizon would offer as an alternative to the hot cut process modeled in Verizon's NRCM.[185] The Department fashions this alternative on the SBC model in Texas. See Texas 271 Order at ¶ 259. The FCC described the two-tier hot cut approach available in Texas as follows:

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185 Presently the only option for CLECs regarding the hot cut ordering process is that Verizon proposes a manual surcharge that would apply when "necessary to manually enter the service order at the CLEC's request" (Exh. VZ-37, Part I, Cost Summary, page 5 n.3).

> SWBT [Southwestern Bell Telephone] makes available two hot cut processes: the fully coordinated hot cut (CHC) process and the frame due time (FDT) hot cut process. CHC orders are manually handled in SWBT's order processing center and require intensive coordination and communication between SWBT and the competing carrier during the actual cutover from SWBT to the competing carrier. FDT hot cuts require both SWBT and the competing carrier to perform necessary work at pre-arranged times, with no communication required at the time of the hot cut. Unlike CHC orders, FDT orders are capable of flowing through SWBT's order processing center without manual work by SWBT's representatives. Although in the past SWBT has represented that the CHC process is too resource-intensive to support commercial levels of demand for lower volume loop orders, SWBT now states that it has sufficient resources to process competing carriers' orders in a timely and efficient manner, regardless of which method they choose. Thus, competing carriers "have their choice of two alternative processes in every case, allowing them to pick the process that best fits their resources and priorities." At present, slightly more than half of all hot cuts are performed with the FDT process; the remainder are performed with the CHC process.

Id.

This two-tier approach places the burden on each CLEC to decide which hot cut process is appropriate given its resources and priorities. This approach also permits Verizon to recover its costs, regardless of which process each CLEC selects. Accordingly, Verizon shall submit two hot-cut coordination options.

I. Feature Port Nonrecurring Costs

1. Introduction

Verizon proposes a service order cost of $0.65 for UNE-P orders and a cost of $7.04 to change the features of an existing UNE-P customer (e.g., caller identification) (Exh. VZ-38, Part I). Optional features are provided by a switch and thus are only ordered by CLECs that are also ordering UNE-P.

2. Analysis and Findings

We are unaware of any explanation by Verizon for proposing an NRC for changing features that exceeds the UNE-P service order charge by more than six dollars. Accordingly, Verizon shall specify a cost of $0.65 for changes to feature port additives to be consistent with the service order costs for UNE-P orders. If Verizon indeed did provide a justification for this cost distinction during the course of the proceeding, it may bring such justification to our attention in its compliance filing.

XI. OPERATIONS SUPPORT SYSTEMS

A. Access to OSS

1. Overview

Verizon proposes rates to recover the forward-looking, ongoing annual recurring costs for providing competitive carriers access to Operations Support Systems (Exh. VZ-26, at 2). Verizon states that it incurs OSS costs amounting to approximately $52 million annually for the entire Verizon East footprint, with Massachusetts' share amounting to approximately $6.4 million (id. at 4). Verizon asserts that these costs will continue for as long as it must provide access to OSS to requesting CLECs and resellers as a UNE (id.). AT&T did not submit cost studies for OSS rates.

In the Consolidated Arbitrations, the Department rejected Verizon's request to recover its expenditures and ongoing costs incurred to modify and provide CLECs with access to OSS covering New York and New England. Phase 4-L Order at 49. The Department found in that proceeding that the OSS TELRIC study Verizon submitted would result in double counting of costs. Id. Further, the Department found that Verizon's proposed joint and common cost factors were already used in the development of resale rates in the Department's Consolidated Arbitrations Phase 2. Id.

Verizon provides CLECs access to OSS in connection with the purchase of UNEs and number portability. CLECs access Verizon's OSS primarily via the Direct Customer Access System ("DCAS") electronic gateway, which enables carriers to interact electronically with the same systems that provide Verizon's OSS functionalities and thus to access them. These functions, as defined by the FCC, are as follows:

(1) Pre-ordering: the process whereby Verizon and CLECs exchange information about current or proposed customer products, services, and UNEs;

(2) Ordering: the process whereby a CLEC submits a request for products, services, and UNEs;

(3) Provisioning: the process whereby Verizon executes a request for a set of products, services, and UNEs and provides the CLEC acknowledgment and status reports;

(4) Maintenance and Repair: the process by which a CLEC initiates a request for repair of existing products, services, and UNEs, with acknowledgments and status reports; and

(5) Billing: the process by which Verizon provides appropriate usage data to facilitate end-user billing. It also involves the exchange of information to process claims and adjustments (see Exh. VZ-26, at 3, citing 47 C.F.R. § 51.319(g)).

2. Positions of the Parties

a. Verizon

Verizon witness Louis Minion's direct testimony addresses two types of ongoing costs to provide competing carriers, whether resellers or UNE purchasers, with the ability to interact with Verizon's OSS: (1) annual capital and operating costs associated with the requisite computer hardware; and (2) software maintenance expenses (Exh. VZ-26, at 4; Verizon Brief at 134). Verizon states that these costs reflect the annual system maintenance of the newly developed or modified core system functionalities, interfaces, and gateway systems, as well as the annual carrying cost of the capital-related and other associated expenses for general purpose computer investment, and system and hardware maintenance costs. According to Verizon, these ongoing costs are above and beyond the development costs for the interfaces, gateways and functionalities themselves (Exh. VZ-26, at 5).

Verizon calculates ongoing maintenance and capital costs by identifying computer requirements, applying appropriate cost factors to develop annual costs, and adding estimated ongoing maintenance activity expenses associated with the continuing support of the initial software development effort. It then assigns the costs to the Verizon East-North specific territory (NYNEX operating companies prior to the merger with Bell Atlantic) or the Verizon East Combined category (Bell Atlantic operating companies prior to the merger with GTE). Verizon attributes to Massachusetts a portion of these costs, which it calculates by dividing the levelized demand forecast of resold lines, UNE loops, and UNE-P in Massachusetts by the levelized demand forecasts in the Verizon East-North and Verizon East Combined categories (id.).

The "general purpose computer" investments on which recurring capital costs are based consist of storage devices, controllers, routers, servers, concentrators, workstations, memory, processors and other items (id. at 5-6). Verizon states that much of the equipment is used for systems serving both Verizon's purposes as well as resellers and UNE purchasers. The cost is calculated on a capacity basis, and the calculation includes all of the associated hardware such as power equipment and coupling facilities (id. at 6).

Verizon developed the forward-looking OSS computer hardware costs based on 1996-1999 computer purchases, the time period in which Verizon completed the necessary investments to begin providing CLECs with access to its OSS. It then adjusted the costs to the lower 1999 price levels to account for declining computer prices (id.). Verizon calculates its hardware costs, expressed in gigabytes of memory ("GIGs") and millions of instructions per second ("MIPs"), as $600/GIGs and $10,000/MIPS. These hardware requirements and associated costs are developed by Verizon's Data Center, Network, and Distributed Resources ("DCNDR") Group, and then are increased by the application of ACFs for network, marketing, various support, cost of capital, depreciation and tax expenses (id.). Verizon indicates that it does not anticipate the need for additional computer hardware-related expenditures for several years (Verizon Brief at 135).

To estimate the annual ongoing maintenance costs of program upgrades, enhancements, and modifications, Verizon applies a 15 percent maintenance factor to the initial gateways and functionalities development expenses. Verizon states that maintenance costs are a function of the total lifecycle cost of the software, rather than investment in the computer equipment that runs the software (Exh. VZ-26, at 11).

Verizon proposes to recover its OSS costs through a monthly recurring charge for resellers and UNE purchasers based on the number of UNE loops, platform/combinations, and resold lines in service – i.e., use of access (id.). Verizon states that this "simplified" rate structure is reasonable, as resellers and UNE purchasers share the costs proportionally based on their usage of access to Verizon's OSS (id. at 12).

To develop the OSS charge, Verizon divides annual recurring OSS costs by the levelized demand forecast to develop the appropriate per-unit rates (id. at 12-13). Verizon states it has used the latest available demand forecast, which covers the period 2001-2005, from its wholesale marketing organization, Telecommunications Industry Services, for UNE loops, platform/combinations, and resold lines. Verizon states that this forecast is developed based on different trends in the states where it operates, including regulatory factors, product availability, competitive climate, and forecasts provided by CLECs to its marketing organization. Upon analysis of these inputs and actual demand, Verizon created a market forecast, projecting demand for the years 2006-2010. The forecast was then levelized over the entire ten-year period beginning in 2001 (id. at 13). Under Verizon's proposal, OSS access costs are spread only across access lines purchased by CLECs on a wholesale basis from Verizon, either as UNE-P, UNE-L, or through resale, because "the ongoing support of these functionalities, interfaces, and modifications are strictly for the benefit of the CLECs and resellers who will be making use of them" (id.at 14). Verizon states that it has no use for "mediated access from the web Graphical User Interface ("GUI") to perform functions associated with pre-ordering, ordering, provisioning, maintenance and billing of end user services," nor "the ability to order an unbundled link without an associated port to provide service to a Verizon end-user" (id. at 15).

In response to AT&T's argument that Verizon's proposed OSS charge would double recover computer-related costs, Verizon contends that, in order to eliminate the possibility of double-counting, it reduced the Other Support ACF[186] to take into account costs assigned to the

[186] The Other Support ACF includes support expenses in information management,

(continued . . .)

separate rate element of "Access to OSS" (id.at 14). Verizon states that "the Access to OSS costs include only the capital and operational costs for computer hardware and systems used to provide the Access to OSS UNE," while the Common Overhead costs for General Purpose Computer hardware and Information Management include different costs, such as those of providing computers and systems operations for general administrative and human resource personnel (Verizon Reply Brief at 159). Verizon asserts that the access to OSS costs and the costs used to calculate the Common Overhead ACF are not the same costs, and "the fact that the costs are from the same categories of costs have no relevance to whether the individual costs assigned to each recovery mechanism are being double recovered" (id.) (emphasis in original). Verizon states, for example, that ARMIS Accounts 2124, 6124, and 6724, in which AT&T alleges the double counting takes place, supply different cost items to different recovery mechanisms (id.).

AT&T claims that Verizon's computer prices are not appropriately forward-looking, because use of 1999 prices as a base overstates investment. However, Verizon argues for a benchmark of 1999 computer price levels on the grounds that all of the gateway systems at issue were in place by the end of 1999 and that the downward trend in computer hardware prices has stabilized in recent years. According to Verizon, the relevant period for purposes of developing OSS recurring charges is 1996 to 1999. Verizon states that using 2002 computer prices as the benchmark is "not a sensible approach or one that would fairly compensate

(. . . continued)

research and development, procurement and expenses and the capital requirements associated with non-revenue producing investments in motor vehicles, special work equipment, land and buildings (excluding CO buildings), general purpose computers, furniture, and official communications and support equipment (Exh. VZ-36, at 49-50).

Verizon MA for its costs" (Verizon Brief at 135). Verizon states that "[i]n order to comply with its obligations under federal law, [it] incurred significant expenditures for computer hardware to provide access to OSS during the period from 1996 to 1999, which enabled Verizon MA to begin providing CLECs with access to its OSS by the end of 1999" (id.). Verizon further states that it does not anticipate the need for additional related computer hardware expenditures for several years and thus these purchases are unlikely to be duplicated.

Finally, Verizon claims that its proposal to assess the OSS charge on wholesale lines only is reasonable. Verizon asserts that its "proposed software maintenance costs for the Access to OSS UNE reflect only the work associated with maintaining the interfaces and systems that permit the CLECs to obtain access to Verizon's OSS, not work that benefits Verizon MA's own retail operations" (id.) (emphasis in original). Verizon contends that it "does not use or benefit from any of the changes that were performed to allow the CLECs access to Verizon's OSS" and that the Department erred in finding otherwise in the Phase 4-O Order (id. at 137). Verizon contends that it was able to identify the development costs incurred in providing CLECs access to OSS and has ensured that its study did not include costs for projects that benefited Verizon's retail operations (id. at 136). Hence, Verizon argues, the maintenance expenses derived from these development costs also do not reflect work that benefits Verizon's retail operations.

b. AT&T

AT&T argues that the Department should reject Verizon's proposed per-line charge for OSS related costs, as it would double recover computer-related costs already recovered by Verizon's ACFs in its recurring rates (AT&T Brief at 164). AT&T states the large and broad categories of costs covered by the Common Overhead ACF[187] subsume the smaller, narrower costs that Verizon seeks to recover in its proposed OSS charges. Contrary to Verizon's claim, AT&T contends that Verizon neglected to make any adjustment to the Common Overhead factor, thereby failing to eliminate the double-recovery problem (id.).

Alternatively, AT&T urges that, if the Department does not reject Verizon's OSS recurring cost charge outright, it reduce the OSS charge so that it is actually based on forward-looking computer hardware costs (id. at 165). AT&T and WorldCom note that Verizon developed its OSS computer hardware costs from 1996-1999 computer price levels, and that "[b]ased on the recent downward trend in computer hardware costs, use of 1999 as the base overstates investment" and is "backward-looking pricing" (Exh. ATT-23, at 46; AT&T Brief at 165).

AT&T recommends a minimum 50 percent reduction in Verizon's OSS hardware costs "based on information provided by Verizon [that] computer hardware costs have declined 60 to 80 percent between 1996 and 1999." However, AT&T claims that a more appropriate reduction would be 75 percent, based on "Moore's Law,"[188] according to which the cost of computer equipment should decline by 75 percent over the four years from 2000 to 2004[189]

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187 The Common Overhead ACF, according to AT&T, is a mechanism by which Verizon recovers for, among other things, computer hardware costs and the costs of information management personnel.

188 Moore's Law, a widely accepted principle in the digital electronics industry, holds that the cost of digital technology decreases by 50 percent every 18 to 24 months. Phase 4-O Order at 8-9. Although labeled a "law," the principle merely describes a trend observed over time.

189 2004 marks the middle of the five-year period assumed by Verizon for the rates to be in effect.

(Exh. ATT-23, at 46; AT&T Brief at 166). In support of its argument, AT&T further notes that the Department, in its Phase 4-O Order, relied on Moore's Law (AT&T Brief at 166, citing Phase 4-O Order at 8-9).

AT&T also argues that if the Department deems certain OSS costs legitimate, those costs should be spread across all of Verizon's access lines, both retail and wholesale, in the same competitively neutral manner required by the Phase 4-O Order (AT&T Brief at 167). In addition, AT&T argues that OSS software maintenance costs should be split 50/50 between Verizon and the CLECs, due to shared benefits (Exh. ATT-23, at 47-48).

3. Analysis and Findings

First we address the double-recovery issue. In the Phase 4-L Order, the Department disallowed Verizon's proposed OSS charges because Verizon's joint and common cost factors already sought to recover the same categories of costs. "Thus, to permit [Verizon] to now assign these same costs to OSS would result in a double-counting of these costs." Phase 4-L Order at 49. Verizon's proposed OSS charges in this case are derived from estimates of the cost of General Purpose hardware, booked to ARMIS Account 2124, along with the cost of maintaining certain computer software, "predominantly" booked to ARMIS Account 6724 (see Tr. 5, at 913, 915, 917). We agree with Verizon that AT&T has not offered concrete evidence to show double recovery. Verizon has subtracted approximately $48 million of ongoing OSS-related costs from the Other Support ACF to remedy the concerns raised in the Phase 4-L Order, and the costs assigned to the Access to OSS UNE are not recovered elsewhere in this proceeding (See Exh. VZ-37, Part G-6, Other Support Factors, Tabs 2, 3, 4, 8). Accordingly, we allow Verizon to recover the Access to OSS UNE costs.

Concerning the issue of whether Verizon's computer hardware prices are forward-looking, we find that the evidence supports AT&T's position. It is undisputed that adherence to the FCC's TELRIC principles requires the use of forward-looking computer prices to determine cost.[190] However, the record suggests that Verizon's costs are historical in nature. Although Verizon's witness Mr. Minion testified that "these costs [ ] will continue to be incurred annually and [Verizon] proposes means to recover these costs" (Exh. VZ-26, at 4), Verizon contradicts that testimony by later stating in its initial brief that "Verizon MA does not at this time anticipate the need for additional related computer hardware expenditures for several years" (Tr. 5, at 949-950; Verizon Brief at 135).

At the time that the Department decided the Phase 4-L Order on October 14, 1999, Verizon had largely completed the purchases for computer hardware. Thus, the Department relied on that circumstance in finding in that Order that Verizon's access to OSS costs were historical and not forward-looking. Verizon's contradictory presentation in this case does not persuade us to depart from our finding in Phase 4-L. Therefore, we reject Verizon's proposed computer hardware costs.[191] Verizon is allowed, however, to recover the software maintenance expenses, which are recurring and forward-looking.

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190 As stated in the Phase 4-L Order at 46, "[t]he pricing of UNEs, per the TELRIC method, is not an exercise in cost recovery. Its purpose, as stated by the FCC, i[s] to provide an estimate of forward-looking costs of a hypothetical telecommunications network using efficient technology to serve current and reasonably expected levels of demand and customers."

191 Because we deny recovery for any of the hardware costs, it is not necessary for us to respond to AT&T's proposal for a 75 percent reduction in hardware costs.

Finally, regarding the issue of how to allocate OSS costs, we note that the Department previously determined that Verizon benefits from improvements to OSS through improved operating efficiency and, thus, should bear a portion of the OSS maintenance costs. The Department ordered allocation of costs based on the total number of access lines. Phase 4-L Order at 54. In challenging the findings in the Department's Phase 4-L Order, Verizon dedicated only a paragraph of direct testimony, simply insisting that, if not for the needs of CLECs and resellers, Verizon "would be able to discontinue such support [for OSS functionalities] and not incur the costs associated with such support" (Exh. VZ-26, at 14). We are not persuaded by Verizon's insufficient evidence that it does not receive a benefit on the retail side from OSS functionality. On the contrary, the record shows that Verizon benefits in a number of ways, including when it utilizes the OSS functionality to win back customers from CLECs (AT&T Brief at 167). Therefore, the Department determines that the OSS costs should be allocated based on the total number of access lines, in this case projected from 2002 through 2007 as provided in Exh. ATT-VZ 4-29-2S.

B. Daily Usage Files

1. Overview

Verizon's service cost study for DUF (Exh. VZ-37, Part F-3), identifies the costs associated with providing a CLEC with daily access to billing service files (Verizon Brief at 59). The costs Verizon seeks to recover with the DUF charge are primarily computer-related costs associated with processing and transmitting call records (Exh. VZ-36, at 187-188). Verizon proposes to charge $0.001624 per billing record sent to the CLEC, the sum of $0.001363 for processing and $0.000261 for transmission (Exh. VZ-37, Part F-3, at 9).

DUF is an optional service that provides detailed records of interLATA local and toll usage, sent each business day to CLECs that purchase unbundled switching from Verizon. CLECs need "accurate and timely" billing information, such as duration and destination, about the calls their customers originate in order to manage their billings and collections (AT&T Brief at 98, citing Exh. VZ-37, Part F-3, at 5; Verizon Reply Brief at 86-87, 87 n.88).

The Department rejected Verizon's DUF costs[192] in the Consolidated Arbitrations, finding that UNE rates approved by the Department already compensated Verizon for forward-looking, computer-related costs, because they were included in joint and common cost factors. Phase 4-O Order at 9, citing Phase 4-L Order[193] at 47-49. Hence, CLECs currently are not charged to receive billing information. Verizon plans to continue providing the information monthly without charge; the DUF charge would apply only if a CLEC elects to purchase billing records on a daily basis (Verizon Reply Brief at 86-87).

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192 DUF was known as Call Usage Detail Service ("CUDS") in the Consolidated Arbitrations. See Phase 4-O Order at 5.

193 The Phase 4-L Order dealt with OSS pricing proposals, but did not address DUF specifically. Phase 4-O Order at 5. In its petition for reconsideration, Verizon asked the Department "to distinguish CUDS and [customer service record retrieval service ("CSR")] as using special facilities other than the general OSS access systems" and maintained that charges proposed for CUDS and CSR were TELRIC-compliant. Phase 4-O Order at 6. The Department's grant of the motion for reconsideration had "no effect on the final result." Phase 4-O Order at 7.

2. Positions of Parties

a. Verizon

Verizon asserts that its proposed DUF charge is proper[194] because it has provided recent data regarding costs and has modified its Other Support ACF[195] to exclude DUF-related costs and eliminate the possibility of double recovery (Exh. VZ-36, at 188-189; Verizon Reply Brief at 87 and n.89). Verizon does not rebut AT&T's charge that it has not adjusted the Common Overhead ACF[196] (Verizon Reply Brief at 87, citing AT&T Brief at 100). Rather, Verizon responds that, in its Corporate Expense Worksheet, "only 15.72 percent of Information Management goes to Common Overhead"; the majority is in the Other Support ACF (Verizon Reply Brief at 87, citing Exh. VZ-37, Part G-2, Tab 5).

Verizon also rejects AT&T's claim that DUF charges, if allowed, should be lower, arguing that AT&T miscalculates the per DUF record charge by treating minutes of use, rather than calls, as the billing unit (id. at 87). In response to the assertion that it has overstated data transmission costs, Verizon reiterates that its assumed cost for central processing unit ("CPU") time was not, as AT&T claims, derived from a 1997 calculation (id. at 88). Verizon also dismisses AT&T's assertion that Moore's Law applies to its computer processing capacity costs (id.). While acknowledging that price per processing unit and storage may go down,

194 Verizon makes one correction to its cost study, stating that the "actual labor rate should be $79.25 per hour rather than $100.42 per hour as noted in the original filing" (Verizon Reply Brief at 88).

195 See Section V.C.7, above, for general discussion of the Other Support ACF.

196 See Section V.C.6, above, for general discussion of the Common Overhead ACF.

Verizon contends that expenses for programs and applications may go up (id.). Additionally, Verizon contends that billing records work is manual and paper-intensive, and thus entails "a large amount of 'other' expenses" (id.).

b. AT&T

AT&T urges the Department to reject Verizon's DUF charges, or at least substantially reduce them, because they constitute "extra" charges that are unsubstantiated, unreasonable, and recovered elsewhere (AT&T Brief at 98-106; AT&T Reply Brief at 76-77). AT&T notes that the Department previously found that a separate charge for providing billing records was inappropriate because the relevant computer-related costs are already accounted for in Verizon's joint and common overhead factors (AT&T Brief at 98-99, citing Phase 4-O Order at 9). According to AT&T, Verizon's proposed DUF charges should be rejected for the same reasons in this proceeding.

AT&T argues that Verizon double counts because it adjusted only the OSS access costs component of the Other Support ACF and has not made a reduction for "separate costs" that Verizon attributes to the provision of billing records (AT&T Brief at 99-100, citing Exh. VZ-37, Part G-6, Tab 8, OSS Adjustment, Exh. VZ-36, at 51). Moreover, AT&T asserts, the narrower costs that Verizon seeks to recover in its proposed DUF charges – namely, total investment in general purpose computers, the cost of computing capacity, and the cost of support personnel – are covered in the broader categories of costs covered by the Common Overhead ACF (id. at 100, citing Exh. VZ-37, Part F-3, Sections 4.1B-4.1D, 4.3A).

Alternatively, AT&T states that, even if Verizon has not double counted costs included in the DUF charge, the charge should still be eliminated or greatly reduced because it amounts to a "material and significant amount" of over 60 cents per month per UNE-P customer, yet Verizon has provided no substantive explanation or record evidence to meet its burden of proof that DUF charges are TELRIC-compliant (id. at 98, 101).

According to AT&T, Verizon's proposed record transmission and record processing costs are both unreasonable. The per record transmission charge is too high, AT&T states, because Verizon is relying on 1997 data for computer processing capacity, presented as "estimates" in the 1997 OSS study and rejected in Phase 4-O (id. at 101-104). AT&T asserts that, if Verizon properly took Moore's Law into account, its estimated computing costs would decrease "by almost 90 percent from 1997 to 2004"[197] (id. at 102-103). AT&T uses Verizon's model to calculate a transmission charge of $0.00008 per record, instead of $0.000261 per record as calculated by Verizon (id. at 103-104).

AT&T also claims Verizon overstates costs associated with support personnel who process CLEC billing records by misstating staffing levels and exaggerating the labor rate (id. at 104-106). AT&T asserts that Verizon must reduce the number of analysts from four to three and adjust the labor rate from $100.42 per hour to $56.05 per hour (id. at 106). With these changes, AT&T concludes, the record processing charge would drop from $0.001363 per record to $0.00081 (id.).

3. Analysis and Findings

The Department rejected Verizon's DUF costs in Phase 4-O of the Consolidated Arbitrations, finding that "UNE and resale rates approved by the Department already

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197 2004 is the midpoint of the five-year period that UNE rates determined in this proceeding are to remain in effect (AT&T Brief at 102).

compensate [Verizon] for forward-looking, computer-related costs. Hence, it could not be permitted to charge for these costs a second time through OSS charges." Phase 4-O Order at 9, citing Phase 4-L Order at 47-49. Although Verizon argued in that proceeding that its DUF charges were distinct from charges proposed for general OSS elements, the Department found: "[i]n that [DUF] involve[s] the extension of computer-related functionality to permit CLEC access to [Verizon] records for UNE and resale, we see no such distinction." Phase 4-O Order at 9. AT&T urges that the Department make the same finding here. We agree with AT&T that Verizon has not demonstrated the reasonableness of the DUF charge through its cost study or testimony.

Verizon states that it has now addressed the concerns previously expressed about double recovery, as well as overstatement of costs (Exh. VZ-36, at 188-189). Indeed, Verizon contends that explicit adjustments to the Other Support and Common Overhead ACFs eliminate any double recovery (id. at 188). However, no such "explicit" adjustment is apparent from examination of the DUF service cost study[198] (Exh. VZ-37, Part F-3). In support of its claim that DUF costs were excluded from the Other Support Factor, Verizon cites a worksheet for Revenue-Producing Computer Investments ("REV PROD GPC") in Part G-6 of its cost study (Verizon Reply Brief at 87 n.89). The worksheet figures, however, do not alleviate our concerns. For DUF costs, Verizon supplies a single "Total DUF-North" sum, which it splits between New York and Massachusetts "based on GPC [general purpose computer] investment," with no explanation of how it allocated the costs between the states. Further,

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198 By contrast, Verizon specifically demonstrates that there is no double recovery in its OSS access charges. See Section XI.A (Access to OSS), above.

Verizon generally attributes the computer investments worksheet figures to product managers and corporate ledgers, without specific information on derivation of DUF costs. Because Verizon has not met its burden of proof to provide evidence of the reasonableness of the DUF charge, and because it failed to demonstrate the absence of double recovery, we deny the proposed DUF charge.

XII. REVIEW CYCLE

A. Introduction

The Department established a five-year cycle for evaluating TELRIC rates. See D.T.E. 98-15-Phases II/III at 15-16. The Attorney General urges the Department to review rates in a shorter interval.

B. Positions of the Parties

The Attorney General urges the Department not to wait another five years before reviewing Verizon's UNE rates (Attorney General Brief at 3). The Attorney General argues that the telecommunications industry is a declining cost industry and, if UNE prices remain static while costs decline, UNE prices will no longer be cost-based in violation of the FCC's pricing standards (id. at 3-4). The Attorney General notes that Verizon projects its UNE costs based on a three-year interval and, accordingly, recommends that the Department commence its next UNE investigation no later than January 2004 (id.).

C. Analysis and Findings

The Department declines to adopt the three-year TELRIC-rate review cycle proposed by the Attorney General. The Department acknowledges that, as a general matter, cost projections over shorter intervals are more reliable. But, rather than establishing a permanent three-year review cycle, the Department prefers to decide whether a review cycle of less than five years is warranted on a case-by-case basis. More precisely, the Department will continue to monitor rates for UNEs and interconnection, and will decide if, and when, reevaluation is appropriate. As such, the Department may on its own motion, or by petition of an interested person, commence its next TELRIC rate investigation prior to the expiration of the five-year interval if the Department determines that such course of action is necessary to adjust inputs or assumptions that, due to the passage of time, are no longer appropriate and should not remain in effect until the Department completes its next five-year TELRIC-rate review. This approach will permit the Department to take into account the dynamic pace of changes in the telecommunications industry without locking into a shorter cycle, whether or not it is needed. Accordingly, the five-year cycle originally established in D.T.E. 98-15-Phases II/III stands.

XIII. CONCLUSION

In this Order, the Department discusses and makes findings on UNE and interconnection costs and rates, and all issues regarding reasonableness of those costs and rates, that were contested by the parties in this proceeding. We assume that intervenors' silence on any of Verizon's proposed rates means that the opposing parties do not contest the reasonableness of those rates. In our examination of Verizon's cost study, we have, in some instances, focused on Verizon's methodology for computing the cost of particular UNEs. In those instances where we direct modifications to methodology or inputs that are applicable to Verizon's calculation of other UNE costs, Verizon shall incorporate such directives comprehensively in its cost studies. Further, the Department has carefully reviewed all of the non-contested rates, and their supporting cost studies, proposed by Verizon, and, unless otherwise indicated above, we find that they are consistent with TELRIC and reasonable, and, accordingly, they are approved as such.

Verizon is required to submit a compliance filing, consistent with the findings herein, within 25 days of the date of issuance of this Order. Verizon shall use the input values approved in this Order in the specific versions of the cost models proposed by Verizon, in preparing the compliance filing. The compliance filing shall include: proposed tariff pages with proposed rates, whose effective date should be the day the pages are filed; a comparison of proposed rates with existing rates; and a request for approval to put the rates in effect in less than 30 days, subject to true-up after the Department reviews the compliance filing. Where recalculations are required according to findings in this Order, Verizon is directed to provide complete and detailed supporting documentation.

XIV. ORDER

After due notice, hearing, and consideration, it is

ORDERED: That the issues under consideration in this proceeding be determined as set forth above; and

FURTHER ORDERED: That Verizon New England, Inc. d/b/a Verizon Massachusetts shall determine the costs of unbundled network elements and interconnection based on the findings in this Order and submit those calculations, along with supporting documentation, in a compliance filing, to be filed with the Department within 25 days of the date of this Order; and

FURTHER ORDERED: That the parties shall comply with all directives contained herein.

By Order of the Department,

________________/s/_________________
Paul B. Vasington, Chairman

________________/s/_________________
James Connelly, Commissioner

________________/s/_________________
W. Robert Keating, Commissioner

________________/s/_________________
Eugene J. Sullivan, Jr., Commissioner

________________/s/_________________
Deirdre K. Manning, Commissioner

APPENDIX A:
Exhibit DTE-5 (modified)

E_C: Current Expenses
E_F: Forward-Looking Expenses
I_B: Book Investment
CB: Current-to-Book investment ratio
I_c: Current investment
FC: Forward Looking-to-Current investment ratio
I_F: Forward-Looking Investment

The FCC calculates plant-specific forward-looking expenses using the following formula (Inputs Order at ¶¶ 369 and n.1178, 369-376):

$$E_F = [E_C / (I_B \text{ x } CB)] \text{x } I_F$$

Option A) (The original Exh. DTE-5 does not include the asterisked terms)

Line	**Item**	**Source**	**Amount**	**Comments**
1	P_B		Copper: \$ 10 Fiber: \$ 1	Book Prices (per mile)
2	N_C		Copper:100 miles Fiber: 10 miles	Current Network
3	I_B	1 x 2	Copper: \$ 1,000 Fiber: \$ 10 Total: \$ 1,010	
4	P_C		Copper: \$ 15 Fiber: \$ 0.80	Current Prices (per mile)
5	I_c	2 x 4	Copper: \$ 1500 Fiber: \$ 8 Total: \$ 1,508	Current network valued at current prices. (reproduction cost)*
6	N_F		Copper: 60 miles Fiber: 50 miles	Forward-looking network
7	I_F	6 x 4	Copper: \$ 900 Fiber: \$ 40 Total: \$ 940	Forward-looking network valued at current price. (replacement cost)*
8	E_C		Copper plant: \$ 10 Fiber plant: \$ 0.10 Total: \$ 10.10	
9	E_F	(8/5) x 7	Copper Plant: \$ 6.03 Fiber plant: \$ 0.50 Total: \$ 6.53	

Option B)

?? Expense per mile:
Copper, \$ 10 / 100 miles = \$ 0.10
Fiber, \$ 0.10 / 10 miles = \$ 0.01

?? E_F = \$ 0.10 x 60 miles + \$ 0.01 x 50 miles
= \$ 6.50

Option C)

?? Current Expense to Investment Ratio:
Copper: \$ 10 / \$ 1,500 = 0.0067
Fiber: \$ 0.10 / \$ 8 = 0.0125

?? E_F = 0.0067 x \$ 900 + 0.0125 x \$ 40
= \$ 6.53

Option D)

?? Forward-looking Expense to Investment Ratio:
Copper: \$ 6.03 / \$ 900 = 0.0067
Fiber: \$ 0.50 / \$ 40 = 0.0125

?? E_F = 0.0067 x \$ 900 + 0.0125 x \$ 40
= \$ 6.53

Appeal as to matters of law from any final decision, order or ruling of the Commission may be taken to the Supreme Judicial Court by an aggrieved party in interest by the filing of a written petition praying that the Order of the Commission be modified or set aside in whole or in part.

Such petition for appeal shall be filed with the Secretary of the Commission within twenty days after the date of service of the decision, order or ruling of the Commission, or within such further time as the Commission may allow upon request filed prior to the expiration of twenty days after the date of service of said decision, order or ruling. Within ten days after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the Clerk of said Court. (Sec. 5, Chapter 25, G.L. Ter. Ed., as most recently amended by Chapter 485 of the Acts of 1971).