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February 20, 1996

IN REPLY REFER TO:

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BY HAND DELIVERY

Ms. Blanca S. Bayo, Director
Division of Records and Reporting
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Resolution of Petition to Establish Non Discriminatory Rates, Terms, and Conditions for Interconnection Involving Local Exchange Companies and Alternative Local Exchange Companies pursuant to Section 364.162, Florida Statutes - Docket No. 950985-TP

Dear Ms. Bayo:

Enclosed for filing in the above-styled docket are the original and fifteen (15) copies of Rebuttal Testimony of Gene E. Michaelson.

Please acknowledge receipt and filing of the above by stamping the duplicate copy of this letter and returning the same to this writer.

Thank you for your assistance in this matter.

Sincerely,

J. Jeffry Wahlen

JJW/csu
Enclosures
cc: All parties of record
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CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing has been furnished by U. S. Mail or hand delivery (*) or overnight express (**) this 20th day of February, 1996, to the following:

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UNITED TELEPHONE COMPANY
OF FLORIDA
CENTRAL TELEPHONE COMPANY
OF FLORIDA
DOCKET NO. 950985-TP
FILED: February 21, 1996

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

REVISED REBUTTAL TESTIMONY

OF

GENE E. MICHAELSON

Q. Please state your name, business address, and title.

A. My name is Gene E. Michaelson. My business address is 999 Third Avenue, Suite 3500, Seattle, Washington 98104. I am a partner in the Telecommunications consulting practice of Ernst & Young LLP.

Q. On whose behalf do you appear?

A. I am appearing on behalf of Sprint-United/Centel.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the direct testimony of Dr. Nina W. Cornell on behalf of MCI Metro Access Transmission Services, Inc. filed in this docket on February 6, 1996

Q. Please describe your professional qualifications and experience.

A. I began my career with Ernst & Ernst (now Ernst & Young LLP) Telecommunications Consulting practice in June 1977 as a staff consultant. I became a partner in the firm on October 1, 1987. During my career with Ernst & Young LLP, I have consulted with both wireline and wireless companies in the areas of public policy, business strategy, and product/service pricing, costing, and profitability. I have completed and reviewed over 200 cost studies of various types for local exchange carriers throughout the United States and in several foreign countries. They include long-run incremental and direct embedded cost-of-service studies for virtually every major service provided by local exchange carriers today. I have testified before regulatory commissions in California, Illinois, Minnesota, Florida, and Nevada in support of these studies. In addition, I have completed and reviewed jurisdictional separations studies prepared pursuant to Parts 36 and 69 of the Federal Communications Commission's ("FCC") rules and regulations. I have also prepared and presented papers at several telecommunications industry conferences and led numerous training programs on the subject of jurisdictional separations, telecommunications accounting, incremental cost-of-service, and the pricing of telecommunications services.

Q. Have you prepared an exhibit to this testimony?

A. Yes. Exhibit GEM-1 is a composite exhibit consisting of three documents, each of which was prepared by me or under by supervision.

Q. Do you agree with Dr. Cornell's statement of the policy goal in this proceeding, which begins on line 1 of page 4 of her testimony?

A. No, I do not. Dr. Cornell's sole goal is to promote the development of effective competition in local exchange markets, which she equates with making sure enough consumers choose the services of one of a number of new entrants. Her policy recommendations flow directly from this statement of her policy goal. There are several fallacies associated with this erroneous statement of the policy goal in this proceeding. First, she is confusing a means with an end. One goal in this proceeding should be to promote a modern, efficient, telecommunications industry in Florida. If, and only if, appropriate ground rules are established, local exchange competition can be a means to achieving this policy goal. Effective competition, however, cannot simply be equated with the marketplace success of a number of well-heeled new

entrants. Regulatory handicaps placed on existing local exchange companies can ensure the success of new entrants while destroying truly effective competition and harming the public. For example, charging competitors less for local termination than Sprint-United/Centel is implicitly forced to charge itself and its customers would ensure the success of the new entrants but would, at the same time, waste economic resources and harm Sprint-United/Centel's customers.

Second, efficiency cannot be the only goal of the Florida Public Service Commission in this proceeding. Presumably, the Commission is also interested in promoting universal service and in ensuring that citizens in every area of Florida are served by at least one carrier. Finally, the Commission will have to balance the interests of Florida consumers, particularly lower income consumers who subscribe only to basic service, with the interests of competitive entrants.

In short, the Commission cannot accept Dr. Cornell's a priori contention that what is good for MCI is good for Florida. This is very important because most of Dr. Cornell's policy recommendations proceed directly from this policy position.

Q. Do you agree with Dr. Cornell's statement beginning on line 21 of page 7 of her testimony of the specific principles that should govern compensation arrangements for terminating local traffic?

A. No, in part, I do not. First, Dr. Cornell states that new entrants must be treated as co-carriers, not as customers. In a competitive market, it is not possible to price discriminate among users of a company's services. Arbitrage is the inevitable result. Further, as Mr. F. Ben Poag has testified, large users will demand that they be given co-carrier status if a price advantage can be obtained via this artificial distinction. Dr. Cornell contends that there is some fundamental difference between the situation of interexchange carriers, who are "customers" and intraexchange carriers, who are "co-carriers." Her reasoning is that the local exchange carriers have a mutual need for services from each other in order to complete calls while, by implication, local exchange carriers and connecting interexchange carriers have no such mutual need. This is plainly incorrect. It is time to recognize that the exchange/interexchange distinction is a regulatory concept that is becoming increasingly difficult to change. It is inappropriate to expect local exchange

companies to price discriminate between exchange and interexchange carriers and increasingly difficult to effectively accomplish in a competitive environment where the same facilities can be used for both exchange and interexchange services.

Also, I need to comment here on Dr. Cornell's statement that compensation must be reciprocal. She later explains, beginning at line 25 of page 9, that she means "that the entrant can charge the same exact price as the incumbent charges for performing the same task, namely terminating a local call." The problem is that Dr. Cornell is not recommending that the same payment occur for performing the same task. My reading of her testimony is that she is recommending that there be no compensation for terminating local calls of other carriers. Each carrier would simply be required to terminate the traffic of other "co-carriers" at no charge, regardless of call volumes, costs, functions performed, or any other factor whatsoever. As I read her testimony, reciprocity in fact means that co-carriers don't charge each other for terminating their calls, a policy she calls "mutual traffic exchange." I am not aware of any economic rationale for this element of Dr. Cornell's first principle.

However, I do agree with her second principle, "that it is very important that the compensation arrangements for terminating local exchange traffic foster efficiency rather than inefficiency." Unfortunately, Dr. Cornell's policy recommendations violate this principle. A price of zero is not an economically efficient charge for terminating competitors' local traffic.

Q. Please comment on Dr. Cornell's arguments in favor of "mutual traffic exchange."

A. Mr. F. Ben Poag has addressed this proposal in his direct testimony, which he refers to as "bill and keep." I will not repeat those arguments here, but I want to emphasize my agreement with them.

Also, I want to comment on the support that Dr. Cornell offers for "mutual traffic exchange." First, she argues that this approach is "obviously reciprocal." Given her definition of reciprocal, this is obviously true, but I have already stated that I know of no justification for reciprocity, as she defines it, meaning no charge for local traffic termination. Her second argument is that "mutual traffic exchange is by far the least cost means of compensating for terminating traffic." While it is

obviously true that not paying for something minimizes the cost of acquiring it, this is not an appropriate justification. Third, she argues that this mechanism gives Sprint-United/Centel the least ability to impose "unnecessary and anticompetitive" costs on entrants. While I agree that if no compensation mechanism for terminating local traffic is established, it can't be abused, this misses the point. If Sprint-United/Centel is forced to incur costs to terminate local traffic for competing carriers without being compensated for it, it will obviously have a huge incentive to discourage such terminating traffic. As a result, Dr. Cornell's recommendation would have the effect of giving the incumbent local exchange carrier an incentive to insist on interconnection arrangements that minimize its costs, even if they are economically inefficient. Her fourth argument is that her recommendation is "neutral in terms of technology and architecture." For the reasons just discussed, paying nothing for terminating access is not technology and architecture neutral. On the contrary, different prices that reflect different costs for alternative technologies and architectures of interconnection are "neutral in terms of technology and architecture." This is what Sprint-United/Centel has proposed. By giving new entrants a choice between

connecting at the end office or at a tandem, Sprint-United/Centel is providing competitors with a wide range of architectural choices. Dr. Cornell's fifth and final argument is that only mutual traffic exchange will incent Sprint-United/Centel to cooperate in the development of number portability but she later characterizes these incentives as "slight." I would say that these incentives are slight to the point of being non-existent. I do not see how failing to compensate me for terminating local traffic from your customers gives me an incentive to cooperate in developing a mechanism that will facilitate you taking customers away from me so there will be more terminating traffic. I am obviously more inclined to pursue number portability if I believe that I will be compensated for the costs it creates. In any case, number portability is an important issue that has been addressed in federal legislation and is extraneous to this proceeding.

Q. Please comment on Dr. Cornell's rejection of Sprint-United/Centel's proposal to use elements of interexchange switched access charges as a basis for local compensation arrangements, which begins at line 22 of page 20 of her testimony.

A. Dr. Cornell rejects the company's approach because she says current regulation prevents it from reflecting these interconnection rates in its own local exchange rates. She goes on to assert that relaxing these regulations would increase the prices that Floridians pay for telephone service. It is extremely important to examine this portion of her testimony carefully, because it goes to the heart of the issues in this proceeding. As I read her testimony, she refutes her own earlier arguments in favor of "mutual traffic exchange" when she testifies that "[i]f Sprint and GTEFL were able to reset their local exchange rates in order to pass an imputation test, it would make entry at least possible, although it would create a significant and unnecessary spiral in local exchange rates." She is clearly conceding that explicit charges for local traffic termination are compatible with efficiency and competitive entry, but that this approach can't be used because it would cause local rates to go up.

Let me first expand on the concept of imputation. Imputation means that a local exchange carrier would "impute" the price it charges competitors for performing bottleneck functions into the price floor for the prices it charges for its own competing retail services that use

these same bottleneck functions. Imputation results in competitive equity because the owner of the bottleneck and its competitors both effectively pay the same price for using the bottleneck. It replicates behavior in competitive markets.

Dr. Cornell is not correct when she states that imputing the interexchange access rates which Sprint-United/Centel proposes to charge into the company's local exchange service rates would cause an upward spiral in rates for the company's services. Imputation would not increase the company's costs and so it would not increase the revenues which the company needs to generate in the marketplace. Imputation might cause some rates to increase, but, at the same time, would allow other rates to be decreased. Thus, the "worst case" is not that local exchange rates in the aggregate rise, but that a revenue neutral rate restructuring of local exchange rates is necessary.

Let me illustrate the concept of imputation and the potential rate restructuring that may result with its adoption by describing a highly simplified example, which is shown as Document 1 of Exhibit GEM-1. Suppose that a local exchange company provides only two services, basic

local exchange service and an optional custom calling feature package. (Obviously, the Company provides more than two services. Clearly, the restructuring I discuss could be applied to any and all of these services and not just the two presented here.) Also, suppose that basic local exchange service costs the company $15 per month to provide and it charges $10, pursuant to regulation, while the custom calling feature package costs $1 per month to provide and that the company charges $10 per month for it. Further, assume that in the aggregate these prices cover the total costs of the firm (including a fair rate of return and all fixed costs), not just the service incremental costs of the two services.

Now, if local exchange competition is introduced, the company must then impute the cost of local termination into the price floor for basic exchange service. Since the company must set its prices above incremental cost in order to recover its total costs, the price floor for basic exchange service becomes, say, $16, the original cost of $15 plus a competitively equitable contribution to fixed costs of $1 for bottleneck local termination functions. An imputation requirement would cause the basic exchange rate to increase from $10 to $16, but, since the company's total cost is unchanged, the custom

calling charge could be decreased. If everyone subscribed to custom calling features, that price could be decreased from $10 to $4 and the subscribers' total bills would be unchanged. Imputation results in a redistribution of charges, but does not cause an increase in overall charges.

The problem, of course, is that everyone subscribes to basic local exchange service, but not everyone subscribes to custom calling features, so, while imputation does not change the average bill for local exchange services, it changes the bills of particular customers depending on what services they subscribe to. If, for example, only one-half of all subscribers take custom calling features, the price of custom calling features would have to increase to $19 in order to recover the firm's total cost, holding the price for basic service constant. This is shown on Document 2 of GEM-1. After imputation, the result would be that subscribers who do not subscribe to custom calling features would experience a 60% rate increase (from $10 to $16) while subscribers who subscribe to basic service and custom calling features would experience a 21% decrease (from $29 to $23) due to the reduction in custom calling allowed by imputation. The average local exchange bill would not change from the

original $19.50.

This example demonstrates the shift from a regulated rate structure designed to promote universal service to a competitive market rate structure. Note that the regulated rate structure creates a tremendous opportunity for competitive entry. The entrant can choose to only serve the portion of the market that subscribes to basic local exchange service and custom calling features, leaving those who only subscribe to subsidized basic service to be served by the local telephone company. The entrant might very well be able to offer a lower price and earn excess profits even if it were less efficient than the incumbent local exchange carrier, because it would be free of the regulatory obligation to subsidize basic ratepayers. This follows from a well established theorem in contemporary economics which holds that, if a company is earning normal profits and serving some customers at less than incremental cost, it must necessarily be serving other customers at more than the stand-alone cost of serving the latter alone. By avoiding service to the subsidized customers, new entrants can compete for the other customers who are being served at more than stand-alone cost.

Q. Do you then advocate abandoning imputation in this proceeding?

A. No, I do not. In the long run, competition will force local exchange carriers to revise their local exchange rate structures so as to pass an imputation test for each and every service. Dr. Edward C. Beauvais has presented a cogent description of these trends in his testimony in this proceeding. As the Commission reconsiders the mechanisms for achieving its universal service and carrier of last resort goals, there is a strong potential to reduce the conflict between these goals and those of the competitive entrants. Universal service funding, derived in a competitively neutral manner, could be used to reduce the price and price floor of basic service for specific customer classes. This environment would make it possible to restructure local exchange rates without fear of jeopardizing important social policy goals.

Prior to the time that the Commission revises its universal service and carrier of last resort policies, and during the period that local exchange rates are frozen, a simplified form of imputation can serve to protect the interests of new entrants, even though it will leave incumbent local exchange carriers vulnerable

to inefficient opportunistic niche entry. There is, unfortunately, no way to avoid this without giving local exchange carriers an opportunity to restructure their rates.

My proposal is as follows: Prior to the time at which local exchange carriers are given the opportunity to restructure their local exchange rates, the imputation test should be applied to the revenues, service incremental costs, and imputed local termination charges associated with serving a particular customer class in a particular exchange, and to all customer classes in the aggregate in a particular exchange. As a practical matter, this would mean applying the imputation test for business customers in the exchange, for residence customers in the exchange, and for all customers in the exchange.

Considering the example I presented previously, it is apparent that the two services together passed the imputation test, but the individual services did not prior to rate restructuring. For the reasons I previously stated, this outcome, if anything, is more beneficial to the new entrant than a requirement to pass the imputation test separately for the individual services.

Q. Do you propose that all local exchange companies be required to conduct business and residential imputation studies for each of their exchanges at this time?

A. No, I do not. A requirement that imputation tests be conducted up front for each customer class in each exchange would impose unreasonably burdensome demands on incumbent local exchange carriers without offsetting benefits for the new entrants. I suggest that the imputation test be conducted when a potential entrant specifically identifies business or residence service classes in exchanges that they serve or have the realistic potential to serve and where a credible imputation issue exists. The Commission would order the incumbent local exchange carrier to conduct the imputation test in particular exchanges based upon an acceptable petition from an entrant. As competition develops and repricing is permitted and the Commission addresses universal service and carrier of last resort issues, imputation tests could be extended to classes of services other than business as a whole or residence as a whole, if the benefits appear to outweigh the costs.

Q. Do you agree with Dr. Cornell's testimony, beginning on line 25, page 26, that, if the Commission determines that

compensation for terminating the local calls of competitors is appropriate, rates should be set at "direct economic cost" so they will fall to the "social cost" of providing them?

A. No, I do not. I have read Dr. Cornell's testimony regarding this issue many times and I cannot discern its meaning or its relationship to anything in the contemporary economics literature. The terms "direct economic cost" and "social cost" are not ordinarily used in economic analysis of access prices. As I read her testimony, both terms are the same and correspond to the industry's marginal cost. She appears to be defining economic cost as the marginal cost of the least cost firms in the industry when operating efficiently. If this is what she means, then this is the "cost of the resources that society must give up to produce that good or service," her definition of social cost. Accordingly, I understand social cost and economic cost to be identical and to be equal to the industry long run marginal cost. Given her definitions, I do not understand how the social cost can be above the economic cost, as she says is the case for interexchange services. I believe that her argument here is simply the traditional case for marginal cost pricing cloaked in

novel terms. As I understand her argument, she is saying that setting the price of interexchange access above marginal cost causes the price of toll services to be above marginal cost (or "social cost" or "economic cost"), resulting in inefficient resource allocation in the economy. This is an issue which has been addressed exhaustively in the economics literature for decades and which is well understood.

I have written a paper that discusses the cost concepts applicable here. It is presented as Document 3 of my composite exhibit to this testimony [GEM-1]. I use incremental costs in these discussions, which is standard telecommunications industry practice, instead of marginal costs. All necessary definitions are contained in my paper.

Most of us remember the standard diagram in our beginning economics textbook which shows the price for a good set equal to its marginal cost, the firm earning normal profits, etc. This happy, "first best" result comes about because of assumptions about the shape of the cost function. While useful in a pedantic context, this description doesn't fit the modern telecommunications industry. If a telecommunications firm were to set all

of its prices at marginal, or unit incremental cost, the firm would quickly go bankrupt because it would not recover its total cost. Not surprisingly, the textbook first best, socially optimal result cannot be achieved in the real world. Contemporary economic theory recognizes the reality that not all cost curves fit the naïve textbook example. It recognizes that firms must cover their total costs and that incremental costs at several levels set floors on prices. In my paper, I illustrate this concept. The firm's prices must be set above the applicable incremental cost floors, and, in the aggregate, recover the firm's total cost. This is exactly how unregulated firms in real-world competitive markets or, contestable markets as they are sometimes called, set their prices.

It is absolutely true that the resulting prices are above the first-best theoretical level. This is not unique to local exchange carriers, however. Even if interexchange access charges were set at marginal cost, MCI would not set its retail service prices at marginal cost of interexchange access plus its own marginal cost, because it would go bankrupt if it did. Toll prices today are well above marginal cost because access charges are above marginal cost and the interexchange carriers, as they

must, price their retail services to recover their own total costs. This is as it must be. The issue is how much each of the services of a multi-service firm will be raised in order for the firm to recover its total costs. As has been recognized for decades, the pattern of prices depends on market conditions, with more elastic service prices being raised above cost relatively less than less elastic services. This is as true of MCI as it is of Sprint-United/Centel or any other telecommunications services provider in the same situation.

Dr. Cornell apparently feels that it is unfair for competing carriers to contribute to the recovery of what she calls "the indirect costs of the incumbent local exchange carriers" because it has its own indirect costs to recover. Dr. William Baumol, a long-time expert witness for AT&T has eloquently responded to this argument:

"Closer inspection, however, confirms that these impressions are mistaken. As we have shown, the efficient component-pricing rule offers the prospect of success to entrants who can add efficiency to the supply of the final product, while it ensures that inefficient entrants are not made profitable by an implicit cross-

subsidy extracted from the incumbent. An entrant may have to replicate some of the incumbent's activities or facilities, and the costs of such duplication can render an entrant unprofitable. But, if that is the case under efficient component pricing, then the requisite replication of cost correspondingly renders the entry inefficient and, ultimately, harmful to consumers and to society." See William J. Baumol and J. Gregory Sidak, Toward Competition in Local Telephony, (Cambridge: The MIT Press, 1994), p. 115.

Q. What about Dr. Cornell's contention that firms should look only to their retail customers for recovery of their "indirect costs" as a way of benefiting those customers?

A. I cannot understand this position. First, how can it benefit Sprint-United/Centel's customers to recover all "indirect" costs only from them and not from access and interconnection services provided to its competitors? What standard of fairness or efficiency justifies such an approach? To the best of my knowledge, there is none. Obviously, if Sprint-United/Centel's own retail customers are implicitly paying more for terminating local calls than its competitors pay to terminate calls on the same network, competitive losses will lead to a death spiral

in which these indirect costs are recovered from ever fewer customers. As is recognized in the literature, and stated in the quote from Dr. Baumol, Dr. Cornell's argument amounts to a request for a cross-subsidy to the new entrant from the incumbent local exchange carrier.

Dr. Cornell's primary argument in support of her position appears to be that "interconnection rates cannot be competed down." She belatedly reveals that this justifies pricing interconnection services to recover "the total service long run incremental cost" of interconnection, which she later equates to "direct economic cost." She testifies that this "could be expressed in tenths of a cent per minute." This is an extraordinary position. This docket is about local exchange competition. New entrants will be providing interconnection and access services. Given that MCI is an interexchange carrier, one may reasonably assume that this is its principal incentive to enter the market. Dr. Cornell is asking for a cross-subsidy precisely so she can compete down the cost of access and local termination unfairly. MCI will do this by attracting away customers from Sprint-United/Centel's network. If you have the customer, you provide the access and termination services to him or her. Not only is it incorrect to say that

access and termination service prices cannot be competed down, this is the principal reason that local exchange competition exists.

Q. Do you agree with Dr. Cornell's assertion beginning on line 20 of page 34 of her testimony that new entrants will want to minimize costs but that Sprint-United/Centel will not?

A. No. Both incumbents and entrants will want to minimize costs because they will be competing with each other. Their incentives are no different. If the Commission adopts the proposal outlined in my testimony, Sprint-United/Centel will impute interconnection prices into the price floors of its retail services, so it cannot achieve a competitive advantage by maintaining interconnection costs and prices artificially high. Thus, contrary to Dr. Cornell's testimony, the percentage of interconnecting traffic is irrelevant, because both firms will be paying the same price for local termination on Sprint-United/Centel's network. If new entrants have lower termination costs, this will give them a significant competitive advantage.

Q. I take it, therefore, that you agree with Sprint-

United/Centel's proposal to apply interexchange access charges to local interconnection services provided to competitors?

A. Yes, I do. As I have testified, and as Dr. Beauvais has testified, the time has long since passed in which it is either possible or desirable to discriminate among classes of customers based on the identity of the customer or the type of traffic, such as exchange or interexchange. The opportunities for arbitrage are simply too great in a competitive environment. Consider the fact that MCI Metro's parent is one of the largest interexchange carriers and is currently paying nearly half of its toll revenues to local exchange carriers for access services. Sprint United/Centel will not be able to determine whether traffic terminating to it from MCI Metro's switch is intraexchange or interexchange. Those of us who remember the years of discussion associated with establishing interstate rates for exchange access have unlimited respect for MCI's ability to develop sophisticated arguments for why its traffic should be carried at the lowest possible rate. I can imagine, for example, an argument that it has a single exchange covering the entire state so all intrastate traffic terminating from its network should be consider exchange

traffic.

Even if arbitrage of the resulting discriminatory rate structure were preventable, I would still argue against charging different prices for exchange access and interexchange access. There is general recognition that access charges are priced will above cost and need to be reduced. It is also generally recognized that access rates are too high because regulators are trying to keep the price of basic service low. To the extent that rate restructuring becomes feasible, it is appropriate to reduce both interexchange and exchange access prices. It makes no sense to maintain interexchange access prices too high and to set exchange access prices at zero, as Dr. Cornell proposes. Rather, both need to come down in tandem. Ultimately, the goal should be a price structure that treats all usage of exchange networks in a non-discriminatory way. Dr. Beauvais' testimony provides an excellent illustration of such a rate structure.

Q. Does this conclude your rebuttal testimony?

A. Yes, it does.

UNITED/CENTEL
DOCKET NO. 950985-TP
REBUTTAL TESTIMONY
G. E. MICHAELSON

COMPOSITE EXHIBIT OF

GENE E. MICHAELSON

UNITED/CENTEL
DOCKET NO. 950985-TP
G. E. MICHAELSON
EXHIBIT GEM-1
DOCUMENT 1

Example 1

Assumptions

Costs:

Basic service	$15/line/month
Custom calling	$1/line/month

Prices:

Basic service	$10/line/month
Custom calling	$10/line/month

Basic customers	1,000
Custom calling customers	1,000
Fixed costs	$4,000

Before imputation:

	Basic	Custom Calling	Total
Revenue	$10,000	$10,000	$20,000
Cost	15,000	1,000	16,000
Contribution	(5,000)	9,000	4,000
Fixed costs			4,000
Excess profits			0

After imputation:

	Basic	Custom Calling	Total
Revenue	$16,000	$ 4,000	$20,000
Cost	15,000	1,000	16,000
Contribution	1,000	3,000	4,000
Fixed costs			4,000
Excess profits			0

NOTE:
- Average customer bill is always $20
- Price of basic service goes up $6
- Price of custom calling goes down $6

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DOCUMENT 2

Example 2

Same assumptions except:

Custom calling customers: 500
Price of custom calling: $19

Before imputation:

	Basic	Custom Calling	Total
Revenue	$10,000	$ 9,500	$19,500
Cost	15,000	500	15,500
Contribution	(5,000)	9,000	4,000
Fixed costs			4,000
Excess profits			0

After imputation:

	Basic	Custom Calling	Total
Revenue	$16,000	$ 3,500	$19,500
Cost	15,000	500	15,500
Contribution	1,000	3,000	4,000
Fixed costs			4,000
Excess profits			0

NOTE:
- Average customer bill always $19.50
- Price of basic service goes up $6
- Price of custom calling goes down $12

Issue:
- Customer only taking basic service experiences 60% bill increase
- Customer taking basic service and custom calling experiences bill decrease from $29 to $23

DETERMINING RELEVANT COST

Gene E. Michaelson
Partner
Ernst & Young LLP Telecommunications Consulting

TeleStrategies
Pricing and Costing Strategies Conference
Washington, D.C. March 9-10, 1993

It is a pleasure to speak to you today about an area within the telecommunications industry which has assumed a prominent role in recent years—determining the relevant cost of a service. During the past three years, we have worked nearly full time completing cost of services studies, setting prices and preparing competitive product and service strategies for our clients throughout the U.S. and in several countries around the world. If my experience is any barometer, determining costs and prices for products and services is certainly becoming one of the areas deemed most important by local exchange carriers and other telecommunications carriers alike.

I will cover several main areas in my presentation. First, I will describe the most important issues and principles that companies should consider when completing cost studies. Then, I will present the general methodology Ernst & Young has used to complete dozens of long-run incremental and embedded direct cost studies of virtually every major service offered by local exchange carriers. And, lastly, I will provide my views as to how the information produced by these studies can be used by companies in their day-to-day operations and filings with regulatory commissions.

My presentation will be made from the point of view of a practitioner. The approach we have used to complete studies relies on many of the fine articles and books written by economists. Our task has been to apply the concepts and principles they describe using our knowledge of technology, costing techniques and telephone company operations. Consequently, my presentation will focus on how to complete cost studies, using these widely acknowledged and accepted concepts, and will not attempt to break new theoretical ground.

Definitions

Before describing the principles to be considered in preparing cost studies, it is important to define the terms I will use in my presentation.

I have adopted Rick Emmerson's definitions of incremental and fully distributed costs. These definitions can be found in the direct testimony he filed with the Florida Public Service Commission in connection with its current proceeding on cross-subsidy.[1] Both he and I are testifying in this proceeding later this week.

"**Marginal cost** most often is described as the forward-looking cost of producing *one more unit* of output or the cost saved by producing one less unit of output." Marginal costs are also referred to as **unit incremental costs**, and I will use these terms interchangeably throughout my presentation.

"The **total incremental cost** (or TIC) of a service includes the forward-looking (future) costs avoided or added by discontinuing or offering an *entire* service, holding constant the production levels of all other services produced by the firm."

"The **average incremental cost** (or AIC) of service is the TIC of a single service expressed per unit of output."

"**Fully distributed costs** (or FDC) are the embedded, final costs of services after allocating all the financial accounting costs of a firm to the services or categories of service produced by the firm; common costs and costs shared by groups of services are allocated in addition to the costs caused by each service. By nature, these allocations are arbitrary and are not based in cost causation. Moreover, fully distributed costs, unlike incremental costs, measure historical costs rather than forward-looking costs."

Major Issues and Principles

In order to build on these definitions, I will now discuss some of the important issues and principles which must be considered when preparing cost studies.

The first issue I will describe is really a bedrock principle that should be adhered to when determining service cost and is generally referred to as cost causation. While many people use this term,

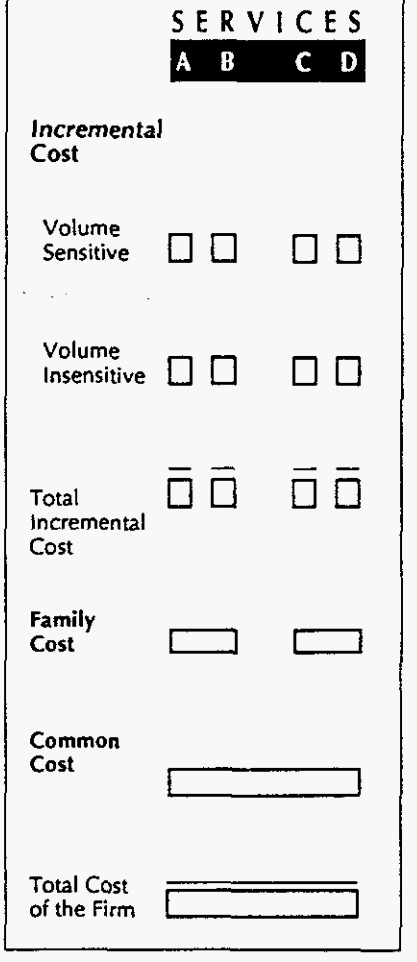
sometimes in different ways, its meaning to me is clear. Cost studies, whether they are incremental or historical in nature, must reflect only those costs that are incurred by providing the service. The fact that a service uses an asset is irrelevant when determining its cost if offering the service in question did not cause its purchase. A good example is the getting started cost of a central office switch. This cost, namely the processor and related investments, must be incurred to provide switched services in a given location but is not impacted by which services are offered in the area. In effect, it is a cost incurred to provide a group or family of services but not any individual service. Thus, even though customers of a service use it, the getting started cost of a switch is not included in the cost of that service, or of any service, since this investment cannot be causally related to providing it. It is caused by providing the family of switched services, such as residence, business and Centrex services just to name a few members of this family.

Additionally, the allocation of family or shared costs and costs that are common to the entire operations of the company to the embedded or incremental cost of a service in an attempt to produce a full distribution of a company's cost should not be attempted since such allocations are, by their very nature, arbitrary and yield distorted and meaningless results. After nearly three decades of debate on the issue of relevant costs, fully distributed costs, sometimes called FDC, have been widely discredited for use in developing a useful measure of product cost or to set prices. Incremental costs, family costs and common costs are depicted on **Exhibit 1.**

The second issue which must be considered is the manner in which the service is provided, both from the standpoint of its technical design and the equipment incorporated in this design. The incremental costs of network investments included in the preparation of long-run incremental cost studies are those that would be incurred by a company in the long run using the most efficient technology and network design. The studies are based on what will happen, not on what has happened in the past. However, the technology and network architecture assumptions used to complete the studies are not hypothetical in nature, since they should reflect the company's fundamental network plans and the manner in which it is currently expanding network capacity and providing service to new customers. Due to the rapid pace of technological change in the telecommunications industry, the network facilities used to provide services in the past, along with the related historical cost of these facilities, will be different than the facilities used in the incremental cost study, sometimes substantially so. Historical cost studies reflect the network designs utilized in the past and include costs which are embedded in the company's books.

The third issue concerns the proper methodology to be used to calculate the cost per unit of network capacity. When determining these costs, we generally incorporate what is known as the capacity cost theory. Most investments in the telecommunications network can be purchased only in large "lumps" of capacity, necessitating the study of costs for increments of demand larger than one unit. It has been rigorously demonstrated in the academic literature that the marginal or unit incremental cost of an investment can be closely approximated by completing a relatively simple calculation in which the annualized investment cost of the individual "lumps" of capacity is divided by the effective quantity of output made possible by that additional capacity. The capacity used in the calculation is stated in terms of the "effective" or "optimum" fill normally derived from the investment un-

Exhibit 1.



der normal operating conditions.

While I leave more detailed discussions and rigorous proofs of the capacity cost theory to others,[2] I will provide a simple illustration here.

On **Exhibit 2**, I have shown the linear cost function of Line Concentrating Modules (LCM) in a Northern Telecom DMS-100 central office switch. The exhibit shows the present demand for lines in the LCM and the new demand assuming that an unexpected influx of customers occurs in the service territory of the company. The stair step shows the point at which the company will add LCMs as its demand increases and the capacity of the LCM is exhausted. The new influx of customers accelerates the purchase of these LCMs by one year. Effectively, the new demand causes the company to carry an additional LCM one-half of the time (i.e., one of every two years). **Exhibit 2** shows this graphically as the shaded area. It can be shown mathematically that the advancement of these investments and quantities have a present value which equals the cost of one LCM divided by its effective or usable capacity.

You will note that the capacity of the LCM used in my example is 600 lines. The maximum capacity of an LCM is 640 lines. I have assumed that 40 lines are reserved for administrative and testing purposes and that only 600 lines can be utilized to provide telephone service to customers. Thus, in this case, the effective utilization factor is 94%.

Thus, if one divides the cost of an LCM by its effective capacity, the unit incremental cost of this investment per line can be estimated.

The capacity cost calculation should only be used, however, if two conditions are met: (1) new units of the item of equipment being studied are expected to be installed for the foreseeable future, and (2) a change in demand can be expected to advance the installation of the next equipment addition.

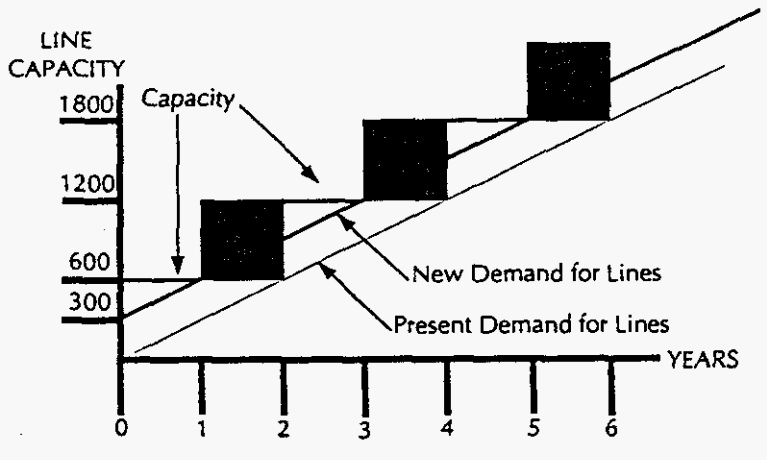
Incremental Cost Studies

I will now address the topic of long-run incremental cost studies. It is my opinion that these are the most relevant studies to use in determining service cost, setting prices, and detecting cross-subsidies. It may sound curious to some of you that a CPA would advocate the use of economic principles and forward-looking rather than historical costs to accomplish these tasks. But after 15 years of experience in telecommunications costing, I have come to the conclusion that the evidence in favor of long-run incremental cost is overwhelming, particularly when compared to the outdated fully distributed costing techniques that were used for years in a monopoly world. But even though one of the main "ingredients" used in our studies is economic theory, our final "dish" includes a large measure of technical network specifications, a dash of accounting theory and practice and a pinch of financial analysis.

Federal Reserve Chairman Alan Greenspan, testifying before Congress recently about the economy, said that "fundamentally, the future is unknowable." Mr. Greenspan is certainly correct; if he were not, those of us who could accurately predict the future would be enjoying a cool beverage on a beach in some isolated part of the world rather than attending a conference in Washington, D.C. However, since we are charged with the responsibility of estimating future costs, given these undeniable uncertainties, let us begin our discussion of long-run incremental cost studies.

Before describing how long-run incremental cost study techniques can be used to determine service costs, it is important to recap what I mean by this term. In the most general sense, the

Exhibit 2.

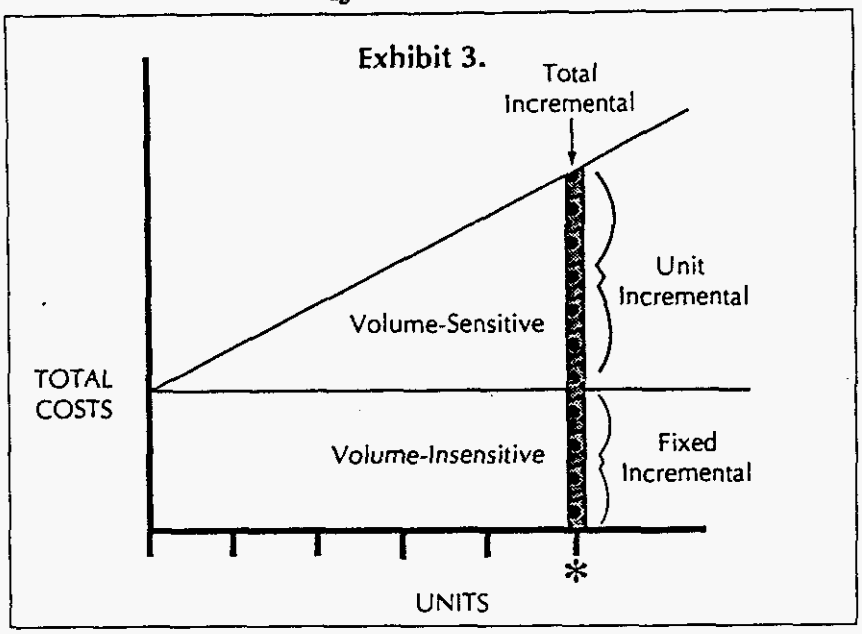


purpose of an incremental cost study is to determine the cost to a firm of taking some action, whether it be raising or lowering a price for a service, introducing or deleting a service, etc. If one is to determine the relevant cost of the anticipated action, it makes common sense to estimate the cost that will be incurred in the future and not to use past costs since the two will most likely differ. This is the practice followed by most successful businessmen and businesswomen today, whether they classify their actions under the rubric of incrementalism or not. This same common sense notion holds true for the telecommunications industry and may, in fact, be more important for this industry than others when you consider the rapid pace at which technology and its related cost are changing.

The key difference between marginal cost and total incremental cost is that the former includes only those costs that would change with a reasonable increase (or decrease) in the volume of the service provided while the latter includes the costs to provide the entire service, including fixed or volume-insensitive costs. **Exhibit 3** graphically depicts the differences I've just described.

It is now generally accepted that marginal costs should be used to set minimum "price floors" while total (or service) incremental costs should be used to determine service costs and to test for cross-subsidies. I will discuss the uses of these studies in more detail later in my presentation.

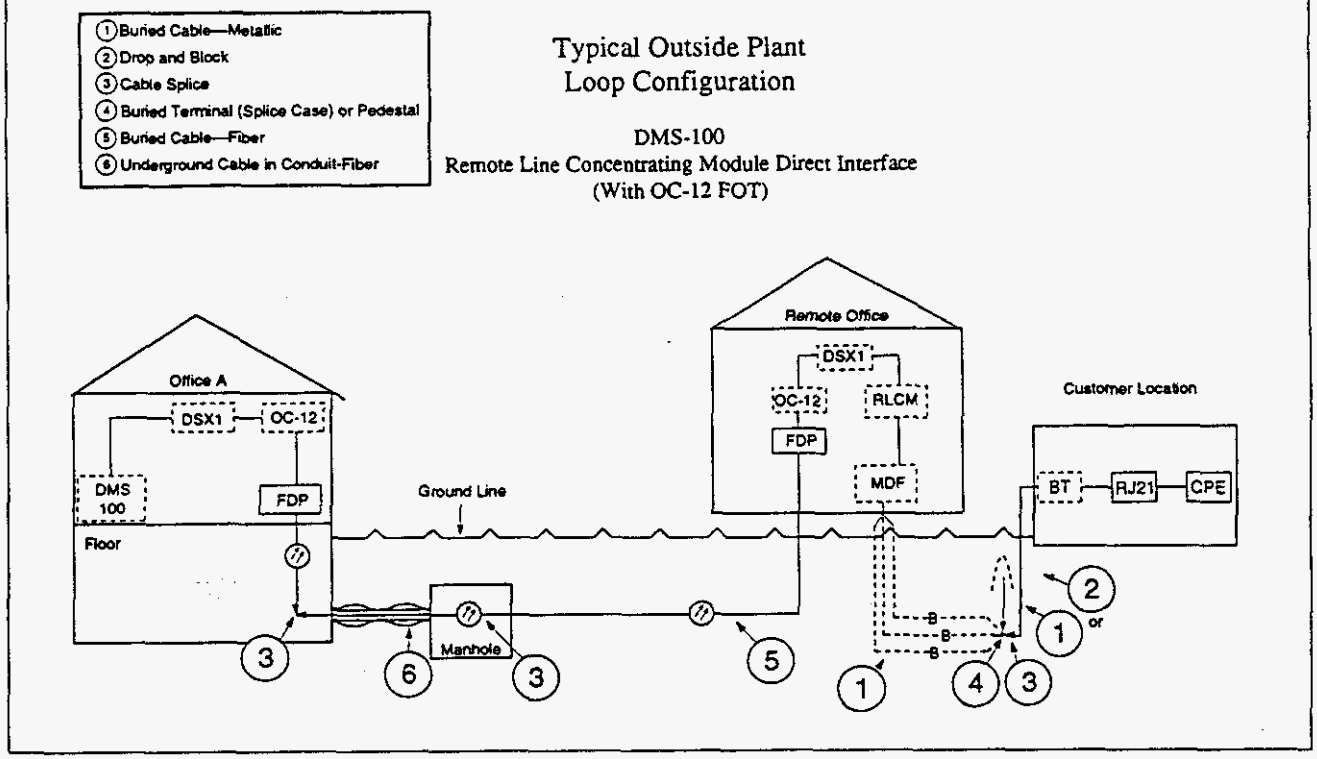
I will now describe the general methodology we have used to complete long-run incremental cost studies. This methodology incorporates the issues and principles just discussed.



The first decision which must be made when completing an incremental cost study has to do with the "run" which the study incorporates. Depending on the context of the study, an analyst may take a short-run, medium-run or long-run view of incremental costs. The significant difference among these alternatives is whether capital investment is treated as fixed (short run), somewhat variable (medium run), or completely variable (long run). A long-run view is often required by regulators, and our studies have been prepared with this principle in mind. However, most analysts agree that it is unrealistic to assume that all capital investment is variable. For example, we sometimes treat certain assets related to the fundamental topology of the network, such as buildings and conduit, as fixed cost and classify them as common and family costs, respectively. These exceptions are made since it is unlikely that the addition of a reasonable increment of an individual service or the introduction of a new service will cause the construction of new buildings or the placement of new conduit, holding constant the production levels of all other services produced by the firm.

Since the objective of the studies is to determine the cost to the firm of adding more units of a service, or a new service, it is necessary to calculate the forward-looking costs of providing the service using the technology and network designs that are and will be employed by a company to provide additional capacity in its network for this service. To do this, we typically conduct a series of detailed discussions with a company's engineers to determine its current network configuration and to ascertain how it will evolve in the future. The company's engineers then prepare a series of standard engineering designs (SEDs) that are and will be used to provide its telecommunications services, including the service we are studying. These SEDs form the basis of the long-run incremental cost study for this service. **Exhibit 4**

Exhibit 4.



depicts an example of a loop design that incorporates a remote electronic terminal (in this case, a Remote Line Concentrating Module (RLCM)). Obviously, there are many other possible loop configurations.

In general, most of our clients have developed long-range fundamental plans that call for the continued implementation of these remote electronic devices in their loop networks where it can be shown to be cost-effective. Specifically, the company engineers design what are called Feeder Distribution Areas (FDAs) or Carrier Serving Areas (CSAs) in their service territories. In these designs, the area with a radius of between 12,000 and 16,500 feet from the central office is served directly with copper cables. Beyond this point, a series of additional circles are established to be served by remote electronic systems. These electronic serving areas are fed by fiber systems, with one end in the host central office and the other in the remote terminal in the center of the serving area. Copper completes the loop from the remote terminal to the subscriber's location. In this way, the company can supply subscribers with the necessary connections to the network without the problems associated with traditional resistance design methods, e.g., long loops requiring load coils.

In addition, these fundamental plans generally call for an all digital switching and all fiber interoffice network. Many of these networks are not only equipped with SS7 capability but, in some cases, also incorporate SONET systems and the technology necessary to offer services such as FDDI.

Once these designs are determined, the current cost of each element in the design is collected using recent job/work orders and vendor price quotations. These cost elements include the cost of cable and wire facilities, remote electronics, repeaters, building terminals, transmission facilities, etc., used to connect customers with host central offices.

In order to complete the studies, it is necessary to gather actual information about the service which could be used to estimate the cost of adding lines in the future using these designs. Since it is impractical to study the characteristics of all lines of a service, we accomplish this task by drawing a statistically valid sample from the total population. These lines are selected randomly using a statistical sampling software package. For each line selected in this process, certain information is summarized, including the length of the loop, the size and type of cable used to

provide service, the size of building terminal, etc. Once this information is gathered, the loops are sorted by the corresponding standard engineering designs with which they are most appropriately associated and priced out according to the information required to provide service. In a long-run study it is the SEDs, and not the existing serving arrangement, that determine how the cost of each line is calculated. Once the cost of all loops is determined by using the process just described, the overall incremental cost of the loop investments used to provide the service is determined by weighting the costs for each SED by its associated probability of occurrence.

The costs developed by using the unit costs and the quantities specified in the SEDs are then adjusted for utilization factors according to the capacity cost concept discussed earlier. Utilization is determined by considering the maximum level of output available from the facility under normal operating conditions. This is sometimes referred to as "effective" or "optimum" fill. Obviously, many investments cannot be used at 100 percent of their theoretical capacity, since telephone companies normally reserve a certain number of units of capacity for administrative purposes, such as testing. An example of this situation is cable plant, which many companies estimate can be used up to 85 percent of its total available capacity. In other cases, the utilization is considered to be 100 percent. This generally occurs when a facility is portable and has a relatively smaller capacity, as in the case of channel plugins. The unit costs are adjusted by simply dividing the costs by the quantity provided multiplied by this utilization factor. In the cases where the factor is less than 100 percent, the cost of the facilities that will not be utilized is spread among the facilities available to provide service to customers.

The remaining network investment components used to provide a switched service are the central office line termination, switching and trunk equipment and interoffice transmission facilities. In most cases, we have determined the central office line and trunk costs using sophisticated models provided by Bellcore to our clients or by the vendor of the equipment. Bellcore's Switching Cost Information System (SCIS) is a complex software program that creates a model office, summarized by cost components, using traffic, line, trunk, usage, and feature data, which is input by the user, and the vendors' current provisioning requirements and prices. A related program called SCIS/IN calculates intelligent network feature costs for many different services. It should be noted that our clients, not Ernst & Young, are licensed users of the Bellcore software programs and that our role has been to assist our clients in preparing the inputs to these system, evaluating the outputs, and incorporating them in our studies.

For those companies that are not SCIS customers, we have used the Northern Telecom, Inc. (NTI) program actually used to provision new central offices and additions to existing offices to estimate incremental switching and trunking costs. This program is called NT Access. When used as a planning model, the user inputs certain key office characteristics, similar to those required for SCIS, and the remaining inputs required to provision a central office are calculated by the program using the latest vendor requirements and specifications. NT Access provides a fully provisioned central office, by individual investment component, which reflects the most efficient central office design offered by NTI. The inputs to the program can then be altered to model the effect that an increase or decrease in lines, traffic, etc., would have on total central office costs.

Interoffice cost can be determined using related Bellcore models. However, our experience has demonstrated to us that the unit cost of interoffice facilities is minimal in those cases where an all fiber design is assumed. This is due to the tremendous capacity found in today's fiber optic terminals and since we normally consider the fiber itself to be a volume-insensitive cost associated with a family of services and not associated with any particular service. As such, we have normally simplified this portion of our studies by examining the incremental cost of adding fiber transmission capacity at all or certain wire centers and weighting these costs according to busy hour trunk usage at these locations.

Lastly, the appropriate operating expenses and taxes are estimated for the service being studied. Two methods can be used to calculate operating expenses. The first method involves conducting special service-specific studies designed to isolate the

incremental expenses that are incurred by the company annually to provide the service. Examples of these special studies are the determination of software used to provide Centrex service and the cost of product managers and sales expense incurred during the study period. In other cases where it is difficult to segregate the expenses incurred to provide one service from other services but which are, nonetheless, associated with the service and vary with the quantity of units provided, a factor can be used to estimate the expenses. General maintenance of the cable and wire facilities in the telephone network is an example of this type of expense. These factors can be developed by dividing the annual operating expense for the study year by the average investment to which it relates. Multiplying this factor by the incremental investment provides a reasonable estimate of operating expenses in those cases where the current network topology will not differ greatly from that anticipated in the future.

Note that there are a large number of operating expenses that are not directly caused by the offering of individual services, such as the common costs. An example of the latter that is usually cited is executive expenses. These expenses are not included in the incremental cost of a service or service family since they cannot be causally related to them.

Finally, the network investments and operating expenses identified using this methodology are then combined to yield the incremental cost of the service. Specifically, the cost of each network investment is converted to an annual cost flow through the use of an annual return on investment factor. This factor takes into consideration the estimated tax and book lives of the investment, the capital structure and cost of capital of the company, and the federal and state income tax rates. Utilizing this information, a computer program developed by Ernst & Young calculates a capital cost factor that equalizes the annual amounts to be incorporated in the incremental cost results in a manner which resembles that used to determine a home mortgage payment. The capital cost factor includes a return on investment, capital recovery, and federal and state income taxes. The capital costs are then combined with an estimate of annual operating expenses and taxes to produce an incremental revenue requirement.

This annual revenue requirement reflects the total company incremental cost of providing additional units of service or an entire service, depending on the type of incremental cost study performed. Even though I've indicated that the results of the studies are presented on a total company basis, this does not imply that *all* of the costs of the company are allocated to each service in the way in which a fully distributed cost study would reflect costs. Rather, the incremental cost studies include only those costs associated with the service provided and do not include any arbitrary allocation of costs which are common to all services. In addition, we present the total company costs on a nonjurisdictional basis. That is, the incremental investments and operating expenses were not multiplied by "separations" factors (as detailed in Part 36 of the FCC's rules and regulations) to determine interstate and intrastate amounts since jurisdictional revenue requirements have no basis in economic reality.

Historical Cost Studies

There are two types of historical studies typically completed in the telecommunications industry: fully distributed and embedded direct.

It is possible to determine the embedded direct cost of a service by causally relating the historical cost incurred to provide the service based on its past network design and test period operating expenses. But it is impossible to allocate *all* of the costs embedded in the books of a telecommunications company to each of its services using the principles of cost causation. This is due to the economies of scale and scope found in the telecommunications network and operations of local exchange carriers. The family and common costs, which are the most prominent examples of economies of scale and scope, cannot, by their very nature and definition, be assigned to any service. Obviously, anyone with a calculator can arbitrarily allocate family and common costs to each service; however, these allocations have nothing to do with cost causation or with a proper measure of service costs and of cross-subsidy.

I sometimes refer to FDC as "funny, dangerous costs." They are funny in the sense that it is almost laughable to watch a cost witness attempt to justify the use of FDC when you consider that there are hundreds of possible arbitrary allocations of cost, none

of which are accurate or meaningful. These allocations, while sometimes cloaked in terms that hint at cost causation, are nothing more than a reflection of the bias and objectives of the party proposing them. The use of FDC can also be dangerous since the service "cost" produced by these studies includes costs that aren't associated with providing it and which would not be avoided if the service was discontinued. If a firm or regulatory commission relied on FDC to determine the profitability of a service and eliminated a service since the revenues it generated were insufficient to cover fully distributed costs, the only costs that would be avoided in the future are its incremental costs. The arbitrarily allocated common costs would remain to be recovered by the customers of the remaining services. But the upward pressure on the rates of those customers would not stop here since the contributions to common cost generated by revenues which exceed the incremental cost of the discontinued service will now also be lost. This "death spiral" is illustrated in Attachment A.

Dr. Alfred Kahn, a noted economist and former chairman of the New York State Public Service Commission, probably best expressed the view that most economists and cost analysts hold regarding FDC when he said in a 1984 article, "[O]nce you abandon marginal cost, it is not *difficult* to find another measure of cost that will serve that purpose, it is hopeless. This is not a question of looking for a black cat in a room in which all of the lights have been turned out. *There is no cat there*" (emphasis in the original).[3]

After considering the foregoing discussion and all that has been written on this subject in the economic and financial literature and by the antitrust courts, it is reasonable to conclude that FDC studies have about as much credibility today as "Dateline's" segment on exploding General Motors pickup trucks.

However, since embedded direct costs are used by some regulatory commission today and have some merit, I will discuss how a relevant study using this concept should be prepared.

We have completed embedded direct cost studies using a general methodology that closely parallels the approach and concepts outlined for long-run incremental cost studies described previously in my presentation. However, at the same time, we recognize certain fundamental differences are required by embedded direct cost studies.

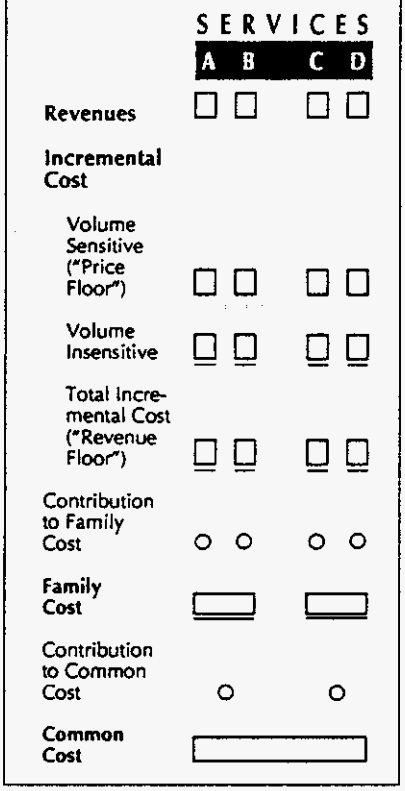
In general, the purpose of an embedded direct cost (EDC) of service study is to calculate the impact on a company's test period revenue requirements of offering a service in the past. For example, if the embedded direct cost of a service includes an annual volume-insensitive cost of $100,000 and volume-sensitive cost of $10 per line per month, and there are 1,000 lines in service during the test period, the annual revenue requirement is $220,000 higher during the test period than it would have been had the service never been offered.

In the case of cash operating expenses, the goal is to identify all of the current costs incurred by the company during the test year as a result of offering the service being studied. We have used the same techniques I just described in connection with incremental cost studies to estimate operating expenses for embedded direct cost study.

The situation is quite different in the case of telephone plant assets. Using techniques that are similar to the incremental methodology, the process involves identifying which assets were placed in service as a direct result of offering the service being studied. In this case, however, there are two major differences. First, the technology and network design incorporated in the study is that purchased and used to provide the service at the time it was offered and not that which would be used in the future. Second, the related costs of the investments included in the studies are those that have already been incurred by the company and reflected in its books and records, rather than the forward-looking costs reflected in long-run incremental cost studies.

It is important to emphasize that the preparation of the embedded direct cost studies is not an exercise in "allocating" accounting costs, as this term is frequently used. In contrast, the methodology used to prepare the studies incorporates techniques for estimating the actual investment impact of offering a particular service on an asset category which is used to provide multiple services. Many, indeed most, traditional allocation factors are inappropriate for this purpose. An embedded direct cost study will not, therefore, correspond to a jurisdictional separations study or a traditional fully distributed cost study.

Exhibit 5.



Uses of Incremental Cost Information

I will first address the uses of incremental cost study results. For the reasons I've stated previously, long-run incremental cost studies should be considered the preferred costing standard since studies based on these principles provide the most useful and reliable basis for making business decisions. However, the choice of either unit or service incremental cost studies depends on the type of decision at hand. As I describe the use of the incremental cost results, it may be helpful to refer to **Exhibit 5**. This exhibit is essentially the same as **Exhibit 1**, but I have added several items which are important for this discussion.

A unit incremental cost study can be used to set the minimum cost or "price floor" to be recovered by the service. This is so since unit incremental cost studies are designed to capture the volume-sensitive costs that a firm will incur each time it provides another unit of the service to a customer. If the price of the service is not set to recover this cost, the company will, in effect, lose money on each additional unit provided and, thus, place a burden on other ratepayers of the service and other services. The famous adage, "you can't make it up on volume," is certainly applicable here.

On the other hand, total incremental cost studies can be used to determine service cost. This is because these studies incorporate the cost of the entire output of the service, which includes volume-insensitive costs and volume-sensitive costs. The total incremental cost establishes the "revenue floor" for all of the customers of the service taken as a whole. While a specific customer may pay a rate which is less than the average incremental cost of the service but above its unit incremental cost, the revenues from all customers should equal or exceed the total incremental cost in order to avoid placing a burden on the ratepayers of other services provided by the company.

It should also be noted that total incremental cost is also used by the antitrust courts to test for subsidy and predatory pricing. The landmark work of Professors Areeda and Turner (1975)[4] provides the basis for the antitrust court standards in this area.

In performing all of these revenue/cost tests and comparisons, it is important to remember that all of the revenues generated by the service should be considered since the incremental costs determined are total company in nature and have not been multiplied by any jurisdictional factors. For example, the incremental cost of flat rate residence service should be compared to the local revenues and Interstate End User Common Line charges.

Uses of Historical Cost Information

In a strict theoretical sense, embedded direct cost studies should not be used to determine service cost or to set minimum price floors. The costs that should be used for this purpose should have some relationship to the period of time the rate for the service will be in effect. Since rates will be charged to customers for services provided in the future, the costs that are used in their development should reflect future costs. Embedded direct costs may be inappropriate to establish service cost or to set price floors since they reflect past costs which may or may not correlate closely with the future costs that a company will incur when serving additional lines or units of a service or offering an entirely new service. This is why many regulatory commissions throughout the U.S. have turned instead to long-run incremental cost studies for these purposes.

However, embedded direct cost studies are often required or traditionally prepared in many states. In some sense, embedded direct cost studies represent a halfway station between traditional fully allocated cost studies, which are widely acknowledged to be inappropriate, and incremental cost analysis, which is becoming more widely accepted as theoretically sound. I

have already described why fully distributed cost studies are not useful or relevant in determining service costs for a multiproduct firm. In addition, actual incremental cost study techniques are quite new to many companies and regulatory commissions and are difficult to implement since they focus on future events. For these reasons, embedded direct cost studies, which rely on historical accounting information but only include costs caused by the service, are sometimes employed by regulatory commissions in place of or in conjunction with incremental analysis.

Embedded direct cost studies should only be used in lieu of incremental cost results if the future period is anticipated to be similar to the historical period from which the investment data is drawn. There are at least two common circumstances under which this will not be true. First, if technological change is significant, entirely different assets will be used in the future to provide the service. For example, if a company intends to convert all interoffice trunks to fiber, historical costs based upon copper trunking are useless. Second, if prices of significant assets are changing in a material way between the embedded amounts recorded in the company's books and those likely to be incurred by the company in the future, the embedded direct cost results are invalid.

On the other hand, if these conditions are met, embedded direct cost study results can sometimes be used to evaluate service costs and to determine the amount of contribution made by each service to the common costs of the firm at a point in time.

I hope this discussion has provided you with some useful "food for thought" about the necessary "ingredients" you will need to develop relevant service cost.

Footnotes

[1] Florida Public Service Commission, Docket No. 910757-TL.

[2] See Emmerson, Richard D., "Theoretical Foundations of Network Costs," 1992 (unpublished manuscript on file with the author); see also Schmid-Bielenberg, Viktor, "Paper on Bellcore's Switching Cost Information System (SCIS) Cost Model, a Practical Approach to a Complex Problem," June 20, 1990, presented at NRRI Symposium on Marginal Cost Techniques for Telephone Companies, Seattle, Washington.

[3] Kahn, Alfred E., "The Uneasy Marriage of Regulation and Competition," *Telematics*, Vol. 1, Number 5, September, 1984, p. 12.

[4] Areeda, Phillip and Turner, Donald, "Predatory Pricing and Related Practices Under Section 2 of the Sherman Act," *Harvard Law Review*, 88, 1975, 637-733.

A Problem with Fully Distributed Costs

Assumptions

- The company provides four products: A, B, C, and D.
- Incremental costs are assigned to each of the services based on service-specific studies.
- Common costs are allocated to the services based on revenues.

	SERVICES				
	A	B	C	D	Total
Revenues	50	40	35	25	150
Incremental Costs	25	23	25	20	93
Contribution Margin	25	17	10	5	57
Common Costs	13	11	9	7	40
Net Income	12	6	1	<2>	17

The company may be inclined to discontinue Service D, since a loss of $2.00 is produced using fully distributed costs. Note, however, that Service D makes a $5.00 contribution to common costs.

If Service D is eliminated, then the following will occur:

	SERVICES				
	A	B	C	D	Total
Revenues	50	40	35	0	125
Incremental Costs	25	23	25	0	73
Contribution Margin	25	17	10	0	52
Common Costs	16	13	11	0	40
Net Income	9	4	<1>	0	12

The company's net income will be reduced from $17.00 to $12.00 due to the elimination of Service D's $5.00 contribution to common costs. Also, Service C now shows a loss due to the reallocation of common costs to the remaining services. Thus, Service C will now be eliminated.

If Service C is eliminated, the following will occur:

	SERVICES				
	A	**B**	**C**	**D**	**Total**
Revenues	50	40	0	0	90
Incremental Costs	25	23	0	0	48
Contribution Margin	25	17	0	0	42
Common Costs	22	18	0	0	40
Net Income	3	<1>	0	0	2

The company's net income has now been reduced from $12.00 to $2.00, due to the elimination of Service C's $10.00 contribution to common costs. Also, Service B now shows a loss due to the reallocation of common costs to the remaining services. Thus, Service B will now be eliminated.

If Service B is eliminated, the following will occur:

	SERVICES				
	A	**B**	**C**	**D**	**Total**
Revenues	50	0	0	0	50
Incremental Costs	25	0	0	0	25
Contribution Margin	25	0	0	0	25
Common Costs	40	0	0	0	40
Net Income	<15>	0	0	0	<15>

With the elimination of Service B, the company now shows a loss of $15.00. This is due to the loss of Service B's $17.00 contribution to common costs. All of the common costs are now assigned to Service A.

This simple example only depicts the effects on net income of eliminating services and the corresponding redistribution of common costs on those services that remain. The "death spiral" I refer to combines these unfavorable results with the fact that the prices associated with the remaining services must be raised to maintain the company's desired profit levels. These price increases will, in many cases, be unattainable due to regulatory constraints or unsustainable in a competitive environment.