2016 Ten-Year Site Plan

Electrical Generating Facilities & Associated Transmission Lines

April 2016

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1.0 Introduction

This report contains the 2016 Lakeland Electric Ten-Year Site Plan (TYSP) pursuant to Florida Statutes and as adopted by Order No. PSC-97-1373-FOF-EU on October 30, 1997. The Lakeland TYSP reports the status of the utility's resource plans as of December 31, 2015. The TYSP is divided into the following nine sections: Introduction, General Description of Utility, Forecast of Electrical Power Demand and Energy Consumption, Energy Conservation & Management Programs, Forecasting Methods and Procedures, Forecast of Facilities Requirements, Generation Expansion Analysis Results and Conclusions, Environmental and Land Use Information, and Ten-Year Site Plan Schedules. The contents of each section are summarized briefly in the remainder of this Introduction.

1.1 General Description of the Utility

Section 2.0 of the TYSP discusses Lakeland's existing generation and transmission facilities. The section includes a historical overview of Lakeland's system, and a description of existing power generating and transmission facilities. This section includes tables which show the source of the utility's current 975 MW of net winter generating capacity and 929 MW of net summer generating capacity (as of the end of calendar year 2015).

1.2 Forecast of Electrical Power Demand and Energy Consumption

Section 3.0 of the TYSP provides a summary of Lakeland's load and energy forecast. Lakeland is projected to remain a winter peaking system throughout the planning period. The forecasts included in this section are for service territory population, accounts, energy sales, net energy for load, peak demand, and hourly load. In addition, sensitivity cases are developed for customers, energy sales, system net energy for load and peaks.

1.3 Energy Conservation & Management Programs

Section 4.0 provides descriptions of the existing conservation and energy conservation & management programs. Additional details regarding Lakeland's energy conservation & management programs are on file with the Florida Public Service Commission (FPSC).

Lakeland's existing energy conservation & management programs include the following programs which promote non-measurable demand and energy savings:

- Residential Programs:
  - Energy Audit Program.
  - Public Awareness Program.
  - Informational Bill Inserts.
- Commercial Programs:
  - Commercial Audit Program.
    - High efficiency lighting
    - Thermal Energy Storage Devices

In addition to Lake Electric's retail conservation programs, the utility has the following Energy Efficiency & Conservation Programs during 2015:

- Insulation rebate
- Energy Saving Kits
- HVAC Maintenance Incentive
- Heat Pump Rebate
- LED Lighting
- On-line Energy Audit
- Energy Star Appliance Rebate

Section 4.0 also contains discussions of Lakeland's solar technology programs. While these types of programs are not traditionally thought of as DSM, they have the same effect of conserving energy normally generated by fossil fuels as DSM programs do by virtue of their avoidance of fossil fuels through the use of renewable energy.

1.4 Forecasting Methods and Procedures

Section 5.0 discusses the forecasting methods used for the TYSP and outlines the assumptions applied for system planning. This section also summarizes the integrated resource plan for Lakeland and provides planning criteria for the Florida Municipal Power Pool, of which Lakeland is a member. The integrated resource plan is fully incorporated in the TYSP and is discussed in further detail in Sections 6 and 7 of this report. Fuel price projections are provided for coal, natural gas, and oil; with brief descriptions of the methodology. Assumptions for the economic parameters and evaluation criteria which are being applied in the evaluation are also included in Section 5.0.

1.5 Forecast of Facilities Requirements

Section 6.0 integrates the electrical demand and energy forecast with the energy conservation & management forecast to determine Lakeland's requirements for the ten-year planning horizon. Application of the reserve margin criteria indicates no need for additional capacity during the current ten year reporting period.

1.6 Generation Expansion

Section 7.0 discusses the current status of any supply-side and reliability evaluation being undertaken by Lakeland to identify the best option for its system. It also discusses basic methodology used by Lakeland in its Generation Expansion Planning Process.

1.7 Environmental and Land Use Information

Section 8.0 discusses the land and environmental features of Lakeland's TYSP.

1.8 Ten-Year Site Plan Schedules

Section 9.0 presents the schedules required by the Florida Public Service Commission (FPSC) for the TYSP.

2.0 General Description of Utility

2.1 City of Lakeland Historical Background

2.1.1 Generation

The City of Lakeland was incorporated on January 1, 1885, when 27 citizens approved and signed the city charter. Shortly thereafter the original light plant was built by Lakeland Light and Power Company at the corner of Cedar Street and Massachusetts Avenue. This plant had an original capacity of 50 kW. On May 26, 1891, plant manager Harry Sloan threw the switch to light Lakeland by electricity for the first time with five arc lamps. Incandescent lights were first installed in 1903.

Public power in Lakeland was established in 1904, when foresighted citizens and municipal officials purchased the small private 50 kW electric light plant from owner Bruce Neff for $7,500. The need for an expansion led to the construction of a new power plant on the north side of Lake Mirror in 1916. The initial capacity of the Lake Mirror Power Plant was 500 kW. The plant was expanded three times. The first expansion occurred in 1922 with the addition of 2,500 kW; in 1925, 5,000 kW additional capacity was added, followed by another 5,000 kW in 1938. With the final expansion, the removal of the initial 500 kW unit was required to make room for the addition of the 5,000 kW generating unit, resulting in a total peak plant capacity of 12,500 kW.

As the community continued to grow, the need for a new power plant emerged and the Charles Larsen Memorial Power Plant was constructed on the southeast shore of Lake Parker in 1949. The initial capacity of the Larsen Plant Steam was Unit No. 4 (20,000kW) and it was completed in 1950. The first addition to the Larsen Plant was Steam Unit No. 5 (1956) which had a capacity of 25,000 kW. In 1959, Steam Unit No. 6 was added and increased the plant capacity by another 25,000 kW. Three gas turbines, each with a nominal rating of 11,250 kW, were installed as peaking units in 1962. In 1966, a third steam unit capacity addition was made to the Larsen Plant. This was Steam Unit No.7 having a nominal 44,000 kW capacity and an estimated cost of $9.6 million. This brought the total Larsen Plant nameplate capacity up to a nominal 147,750 kW.

In the meantime, the Lake Mirror Plant, with its old and obsolete equipment, became relatively inefficient and hence was no longer in active use. It was kept in cold standby and then retired in 1971.

As the city continued to grow during the late 1960's, the demand for power and electricity grew at a rapid rate, making evident need for a new power plant (Plant 3). A site was purchased on the north side of Lake Parker and construction commenced during 1970. Initially, two diesel units with a peaking capacity of a nominal rating 2,500 kW each were placed into commercial operation in 1970.

Steam Unit No. 1, with a nominal rating of 90,000 kW, was put into commercial operation in February 1971, for a total cost of $15.22 million. In June of 1976, Steam Unit No. 2 was placed into commercial operation, with a nominal rated capacity of 114,707 kW and at a cost of $25.77 million. This addition increased the total capacity of the Lakeland system to approximately 360,000 kW. At this time, Plant 3 was renamed the C. D. McIntosh, Jr. Power Plant in recognition of the former Electric and Water Department Director.

On January 2, 1979, construction was started on McIntosh Unit No. 3, a nominal 334 MW coal fired steam generating unit which became commercial on September 1, 1982. The unit was designed to use low sulfur oil as an alternate fuel, but this feature was later decommissioned. The unit uses a minimal amount of natural gas for flame stabilization during startups. The plant utilizes sewage effluent for cooling tower makeup water. This unit is jointly owned with the Orlando Utilities Commission (OUC) which has a 40 percent undivided interest in the unit.

As load continued to grow, Lakeland continually studied and reviewed alternatives for accommodating the additional growth. Alternatives included both demand- and supply-side resources. A wide variety of conservation and energy conservation & management programs were developed and marketed to Lakeland customers to encourage increased energy efficiency and conservation in keeping with the Florida Energy Efficiency and Conservation Act of 1980 (FEECA). Changes to the FEECA rules in 1993 exempted Lakeland from conservation requirements, but Lakeland has remained active in promoting and implementing cost-effective conservation programs. These programs are discussed in further detail in Section 4.0.

Although demand and energy savings arose from Lakeland's conservation and energy conservation & management programs, additional capacity was required in the early 1990's. Least cost planning studies resulted in the construction of Larsen Unit

No. 8, a natural gas fired combined cycle unit with a nameplate generating capability of 124,000 kW. Larsen Unit No. 8 began simple cycle operation in July 1992, and combined cycle operation in November of that year.

In 1994, Lakeland made the decision to retire the first unit at the Larsen Plant, Steam Unit No. 4. This unit, put in service in 1950 with a capacity of 20,000 kW, had reached the end of its economic life. In March of 1997, Lakeland retired Larsen Unit No. 6, a 25 MW oil fired unit that was also nearing the end of its economic life. In October of 2004, Lakeland retired Larsen Unit 7, a 50MW oil fired steam unit.

In 1999, the construction of McIntosh Unit No. 5, a simple cycle combustion turbine was completed, having a nominal 225MW. The unit was released for commercial operation in May, 2001. Beginning in September 2001, the unit underwent conversion to a combined cycle unit through the addition of a nominal 120 MW steam turbine generator. Construction was completed in spring 2002 with the unit being declared commercial in May 2002. The resulting combined cycle gross capacity of the unit is 345 MW summer and 360 MW winter.

During the summer of 2001, Lakeland took its first steps into the world of distributed generation with the groundbreaking of its Winston Peaking Station. The Winston Peaking Station consists of 20 quick start reciprocating engines each driving a 2.5 MW electric generator. This provides Lakeland with 50 MW of peaking capacity that can be started and put on line at full load in ten minutes. The Station was declared commercial in late December 2002.

In 2009 Lakeland Electric installed selective catalytic reduction (SCR) on the McIntosh Unit 3 for NO_x control to provide full flexibility in implementing the Federal Cap and Trade program for nitrogen oxides (NOx) required under the Clean Air Interstate Rule (CAIR).

Steam Unit No. 1 at the McIntosh Plant was retired from service on December 31, 2015. This unit had a nominal rating of 90,000 kW and had been in service since 1971.

2.1.2 Transmission

The first phase of the Lakeland 69 kV transmission system was placed in operation in 1961 with a step-down transformer at the Lake Mirror Plant to feed the 4 kV bus, nine 4 kV feeders, and a new substation in the southwest section of the town with two step-down transformers feeding four 12 kV feeders.

In 1966, a 69 kV line was completed from the Northwest substation to the Southwest substation, completing the loop around the town. At the same time, the old tie to Bartow was reinsulated for a 69 kV line and placed in operation, feeding a new step-down substation in Highland City with four 12 kV feeders. In addition, a 69 kV line was completed from Larsen Plant around the Southeast section of the town to the southwest substation. By 1972, 20 sections of 69 kV lines, feeding a total of nine step-down substations, with a total of 41 distribution feeders, were completed and placed in service. By the fall of 1996, all of the original 4 kV equipment and feeders had been replaced and/or upgraded to 12 kV service. By 1998, 29 sections of 69 kV lines were in service feeding 20 distribution substations.

As the Lakeland system continued to grow, the need for additional and larger transmission facilities grew as well. In 1981, Lakeland's first 230 kV facilities went into service to accommodate Lakeland's McIntosh Unit No. 3 and to tie Lakeland into the State transmission grid at the 230 kV level. A 230 kV line was built from McIntosh Plant to Lakeland's west substation. A 230/69 kV autotransformer was installed at each of those substations to tie the 69 kV and 230 kV transmission systems together. In 1988, a second 230 kV line was constructed from the McIntosh Plant to Lakeland's Eaton Park substation along with a 230/69 kV autotransformer at Eaton Park. That line was the next phase of the long-range goal to electrically circle the Lakeland service territory with 230 kV transmission to serve as the primary backbone of the system.

In 1999, Lakeland added generation at its McIntosh Power Plant that resulted in a new 230/69/12kV substation being built and energized in March of that year. The Tenoroc substation, replaced the switching station called North McIntosh. In addition to Tenoroc, another new 230/69/12kV substation was built. The substation, Interstate, went on line June of 1999 and is connected by what was the McIntosh West 230 kV line. This station was built to address concerns about load growth in the areas adjacent to the I-4 corridor which were causing problems at both the 69kV and distribution levels in this area.

In 2001, Lakeland began the next phase of its 230kV transmission system with the construction of the Crews Lake 230/69kV substation. The substation was completed and placed in service in 2001. This project includes two 230kV ties and one 69kV tie with Tampa Electric, a 150MVA 230/69kV autotransformer and a 230kV line from Lakeland's Eaton Park 230kV substation to the Crews Lake substation.

Early transmission interconnections with other systems included a 69 kV tie at Larsen Plant with Tampa Electric Company (TECO), was established in mid-1960s. A second tie with TECO was later established at Lakeland's Highland City substation. A 115 kV tie was established in the 1970s with Progress Energy of Florida (PEF), now Duke Energy Florida (DEF) and Lakeland's West substation and was subsequently upgraded and replaced with the current two 230 kV lines to PEF in 1981. At the same time, Lakeland interconnected with Orlando Utilities Commission (OUC) at Lakeland's McIntosh Power Plant. In August 1987, the 69 kV TECO tie at Larsen Power Plant was taken out of service and a new 69 kV TECO tie was put in service connecting Lakeland's Orangedale substation to TECO's Polk City substation. In mid-1994, a new 69 kV line was energized connecting Larsen Plant to the Ridge Generating Station (Ridge), an independent power producer. Lakeland has a 30-year firm power-wheeling contract with Ridge to wheel up to 40 MW of their power to DEF. In early 1996, a new substation, East, was inserted in the Larsen Plant to the Ridge 69 kV transmission line. Later in 1996, the third tie line to TECO was built from East to TECO's Gapway substation. As mentioned above, in August of 2001, Lakeland completed two 230kV ties and one 69kV tie with TECO at Lakeland's Crews Lake substation. The multiple 230 kV interconnection configuration of Lakeland is also tied into the bulk transmission grid and provides access to the 500 kV transmission network via DEF, providing greater reliability. At the present time, Lakeland has a total of approximately 128 miles of 69 kV transmission and 28 miles of 230 kV transmission lines in service along with six 150 MVA 230/69 kV autotransformers.

2.2 General Description: Lakeland Electric

2.2.1 Existing Generating Units

This section provides additional detail on Lakeland's existing units and transmission system. Lakeland's existing generating units are located at two existing plant sites: Charles Larsen Memorial (Larsen) and C.D. McIntosh Jr. (McIntosh). Both plant sites are located on Lake Parker in Polk County, Florida. The two plants have multiple units with different technologies and fuel types. The following paragraphs provide a summary of the existing generating units for Lakeland. Table 2-1 summarizes the environmental considerations for Lakeland's steam turbine generators and Table 2-2 provides other physical characteristics of all Lakeland generating units.

The Larsen site is located on the southeast shore of Lake Parker in Lakeland. The site has three units. The total net winter (summer) capacity of the plant is 151 MW (124 MW). Units 2 and 3, General Electric combustion turbines, have a combined net winter (summer) rating of 27 MW (19 MW). The units burn natural gas as the primary fuel with diesel as the backup. Historically, Larsen Unit No. 5 consisted of a boiler for steam generation and steam turbine generator to convert the steam to electrical power. When the boiler began to show signs of degradation beyond economical repair, a gas turbine with a heat recovery steam generator, Unit No. 8, was added to the facility. This allowed the gas turbine (Unit No. 8) to generate electricity and the waste heat from the gas turbine to repower the former Unit No. 5 steam turbine in a combined cycle configuration. The former Unit No. 5 steam turbine currently has a net winter (summer) rating of 31 MW (29 MW) and is referred to as Unit No. 8 Steam Turbine from this point on in this document and in the reporting of this unit. The Unit No. 8 combustion turbine has a net winter (summer) rating of 93 MW (76 MW).

The McIntosh site is located in the City of Lakeland along the northeastern shore of Lake Parker and encompasses 513 acres. Electricity generated by the McIntosh units is stepped up in voltage by generator step-up transformers to 69 kV and 230 kV for transmission via the power grid. The McIntosh site currently includes seven units in commercial operation having a total net winter and summer capacity of 774 MW and 755 MW, respectively. Unit CT1 consists of a General Electric combustion turbine with a net winter (summer) output rating of 19 MW (16 MW). Unit No. 1 is a natural gas/oil fired General Electric steam turbine with a net winter and summer output of 85 MW. Unit No. 2 is a natural gas/oil fired Westinghouse steam turbine with a net winter and summer output of 106 MW. Unit No. 3 is a 342 MW pulverized coal fired unit owned 60 percent by Lakeland and 40 percent by OUC. Lakeland's share of the unit yields net winter and summer output of 205 MW. Technologies used for Unit 3 are very innovative making it a very environmentally friendly coal unit. Unit No. 3 was one of the first "zero-discharge" plants built, meaning no waste water products leave the plant site untreated. Unit No. 3 also includes a wet flue gas scrubber for SO_2 removal and uses treated sewage water for cooling water. Two small diesel units with a net output of 2.5 MW each are also located at the McIntosh site.

McIntosh Unit No. 5, a Siemens 501G combined cycle unit, was initially built and operated as a simple cycle combustion turbine that was placed into commercial operation May, 2001. The unit was taken off line for conversion to combined cycle starting in mid-September 2001 and was returned to commercial service in May 2002 as a combined cycle unit with a rating of 354 MW winter and 338 MW summer. The unit is equipped with Selective Catalytic Reduction (SCR) for NO_x control.

Lakeland Electric constructed a 50-megawatt electric peaking station adjacent to its Winston Substation in 2001. The purpose of the peaking plant was to provide additional quick start generation for Lakeland's system during times of peak loads.

The station consists of twenty (20) EMD 20 cylinder reciprocating engines driving 2.5 MW generators. The units are currently fueled by #2 fuel oil but have the capability to burn a mix of 5% #2 oil and 95% natural gas. Lakeland currently does not have natural gas service to the site.

The plant has remote start/run capability for extreme emergencies at times when the plant is unmanned. The station does not use open cooling towers. This results in minimal water or wastewater requirements. Less than three quarters of the six (6) acre site was developed leaving considerable room for water retention.

The engines are equipped with hospital grade noise suppression equipment on the exhausts. Emission control is achieved by Selective Catalytic Reduction (SCR) using 19% aqueous ammonia. The SCR system will allow the plant to operate within the

Minor New Source levels permitted by the Florida Department of Environmental Protection (DEP).

Winston Peaking Station (WPS) was constructed adjacent to Lakeland's Winston Distribution Load Substation. Power generated at WPS goes directly into Winston Substation at 12.47kV distribution level of the substation and has sufficient capacity to serve the substation loads. Winston Substation serves several of Lakeland's largest and most critical accounts. Should Winston lose all three 69kV circuits to the substation, the WPS can be on line and serving load within ten minutes. In addition to increasing the substation's reliability, this arrangement will allow Lakeland to delay the installation of a third 69kV to 12.47kV transformer by several years and also contributes to lowering loads on Lakeland's transmission system.

2.2.2 Capacity and Power Sales Contracts

Lakeland currently has no long term firm power sales contract in place as of December 31, 2015.

Lakeland shares ownership of the C. D. McIntosh Unit 3 with OUC. The ownership breakdown is a 60 percent share for Lakeland and a 40 percent ownership share for OUC. The energy and capacity delivered to OUC from McIntosh Unit 3 is not considered a power sales contract because of the OUC ownership share.

2.2.3 Capacity and Power Purchase Contracts

Lakeland currently has no long term firm power purchase contracts in place as of December 31, 2015.

2.2.4 Planned Unit Retirements

Other than the retirement of McIntosh Steam Unit 1 (85MW) on December 31, 2015, Lakeland has no set retirement plans in place for any other units due to the current economic conditions of the electric utility industry and the uncertainty that those conditions present.

2.2.5 Load and Electrical Characteristics

Lakeland's load and electrical characteristics have many similarities with those of other peninsular Florida utilities. The peak demand has historically occurred during the winter months. Lakeland's actual total peak demand (Net Integrated) in the winter of 2015/2016 was 589 MW which occurred on January 25, 2016. The actual summer peak in 2015 was 630 MW and occurred on June 18, 2015. Lakeland normally is winter peaking and expects to continue to do so in the future based on expected normal weather. Lakeland's historical and projected summer and winter peak demands are presented in Section 9.0.

Lakeland is a member of the Florida Municipal Power Pool (FMPP), along with Orlando Utilities Commission (OUC) and the Florida Municipal Power Agency's (FMPA) All-Requirements Power Supply Project. The FMPP operates as an energy pool with all FMPP capacity from its members committed and dispatched economically together. Commitment and dispatch services for FMPP are provided by OUC. Each member of the FMPP retains the responsibility of adequately planning its own system to meet native loads, obligations and reserve requirements.

2.3 Service Area

Lakeland's electric service area is shown on Figure 2-1 and is entirely located in Polk County. Lakeland serves approximately 246 square miles of which approximately 174 square miles is outside of Lakeland's city limits.

Table 2-1
Lakeland Electric
Existing Generating Facilities
Environmental Considerations for Steam Generating Units

			Flue Gas Cleaning		
Plant Name	Unit	Particulate	SO_x	NO_x	Type
Charles Larsen Memorial	8ST	N/A	N/A	N/A	OTF
C. D. McIntosh, Jr.	1	None	None	None	OTF
	2	None	LS	FGR	WCTM
	3	EP	S	LNB	WCTM
	5ST	N/A	N/A	N/A	WCTM

FGR = Flue gas recirculation
LNB = Low NO_x burners
EP = Electrostatic precipitators
LS = Low sulfur fuel
S = Scrubbed
OTF = Once-through flow
WCTM = Water cooling tower mechanical
N/A = Not applicable to waste heat applications

Source: Lakeland Environmental Staff

Table 2-2a
Lakeland Electric Existing Generating Facilities

Plant Name	Unit No.	Location	Unit Type[3]	Fuel[4] Pri	Fuel[4] Alt	Fuel Transport[5] Pri	Fuel Transport[5] Alt	Alt Fuel Days Use[2]	Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen. Max. Nameplate kW	Net Capability Summer MW	Net Capability Winter MW
Charles Larsen Memorial	2	16-17/28S/24E	GT	NG	DFO	PL	TK	---	11/62	Unknown	11,500	10	14
	3		GT	NG	DFO	PL	TK	---	12/62	Unknown	11,500	9	13
	8		CA	WH	---	---	---	---	04/56	Unknown	25,000	29	31
	8		CT	NG	DFO	PL	TK	---	07/92	Unknown	101,520	76	93
Plant Total												124	151

[2]Lakeland does not maintain records of the number of days that alternate fuel is used.

[3]Unit Type

CA	Combined Cycle Steam Part
CT	Combined Cycle Combustion Turbine
GT	Combustion Gas Turbine
ST	Steam Turbine

[4]Fuel Type

DFO	Distillate Fuel Oil
RFO	Residual Fuel Oil
BIT	Bituminous Coal
WH	Waste Heat
NG	Natural Gas

[5]Fuel Transportation Method

PL	Pipeline
TK	Truck
RR	Railroad

Table 2-2b
Lakeland Electric Existing Generating Facilities

Plant Name	Unit No.	Location	Unit Type[3]	Fuel[4] Pri	Fuel[4] Alt	Fuel Transport[5] Pri	Fuel Transport[5] Alt	Alt Fuel Days Use[2]	Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen. Max. Nameplate kW	Net Capability Summer MW	Net Capability Winter MW
Winston Peaking Station	1-20	21/28S/23E	IC	DFO	---	TK	---	NR	12/01	Unknown	2,500 each	50	50
Plant Total												50	50
C.D. McIntosh, Jr.	D1	4-5/28S/24E	IC	DFO	---	TK	---	NR	01/70	Unknown	2,500	2.5	2.5
	D2		IC	DFO	---	TK	---	NR	01/70	Unknown	2,500	2.5	2.5
	GT1		GT	NG	DFO	PL	TK	NR	05/73	Unknown	26,640	16	19
	1		ST	NG	RFO	PL	TK	NR	02/71	12/31/2015	103,000	85	85
	2		ST	NG	RFO	PL	TK	NR	06/76	Unknown	126,000	106	106
	3[1]		ST	BIT	---	RR	TK	NR	09/82	Unknown	363,870	205	205
	5		CT	NG	DFO	PL	TK	NR	05/01	Unknown	292,950	213	233
	5		CA	WH	---	---	---	NR	05/02	Unknown	135,000	125	121
Plant Total												755	774
System Total												**929**	**975**

[1]Lakeland's 60 percent portion of joint ownership with Orlando Utilities Commission.

[2]Lakeland does not maintain records of the number of days that alternate fuel is used.

[3]Unit Type

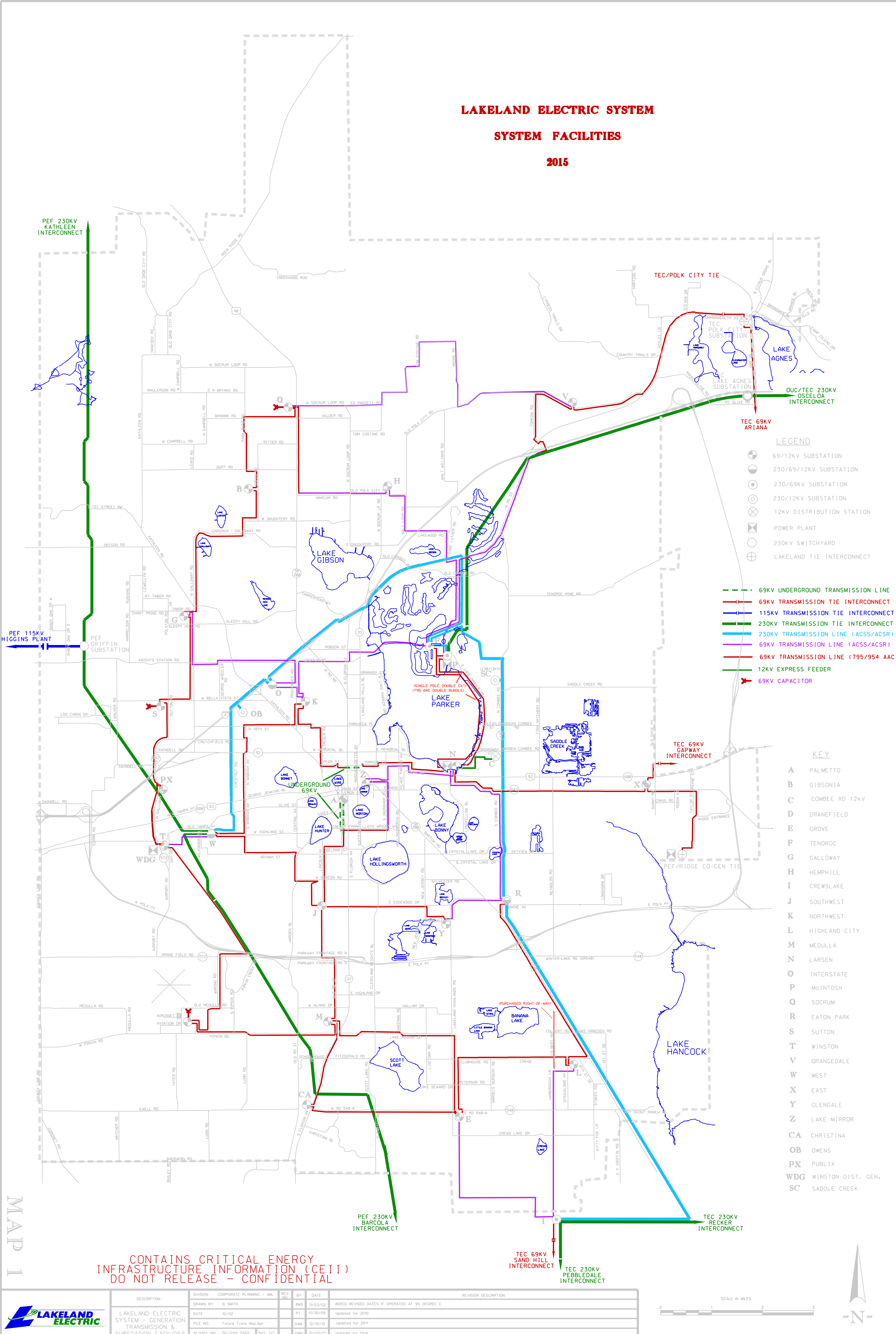
CA	Combined Cycle Steam Part
CT	Combined Cycle Combustion Turbine
GT	Combustion Gas Turbine
ST	Steam Turbine

[4]Fuel Type

DFO	Distillate Fuel Oil
RFO	Residual Fuel Oil
BIT	Bituminous Coal
WH	Waste Heat
NG	Natural Gas

[5]Fuel Transportation Method

PL	Pipeline
TK	Truck
RR	Railroad



LAKELAND ELECTRIC SYSTEM
SYSTEM FACILITIES
2015
PEF 230KV KATHLEEN INTERCONNECT
TEC/POLK CITY TIE
TEC POLK CITY SUBSTATION
LAKE AGNES
LAKE AGNES SUBSTATION
OUC/TEC 230KV OSCEOLA INTERCONNECT
TEC 69KV ARIANA
LEGEND
69/12KV SUBSTATION
230/69/12KV SUBSTATION
230/69KV SUBSTATION
230/12KV SUBSTATION
12KV DISTRIBUTION STATION
POWER PLANT
230KV SWITCHYARD
LAKELAND TIE INTERCONNECT
69KV UNDERGROUND TRANSMISSION LINE
69KV TRANSMISSION TIE INTERCONNECT
115KV TRANSMISSION TIE INTERCONNECT
230KV TRANSMISSION TIE INTERCONNECT
230KV TRANSMISSION LINE (ACSS/ACSR)
69KV TRANSMISSION LINE (ACSS/ACSR)
69KV TRANSMISSION LINE (795/954 AAC)
12KV EXPRESS FEEDER
69KV CAPACITOR
PEF 115KV HIGGINS PLANT
PEF GRIFFIN SUBSTATION
LAKE GIBSON
LAKE PARKER
(SINGLE POLE DOUBLE CKT) (795 AAC DOUBLE BUNDLE)
UNDERGROUND 69KV
LAKE HOLLINGSWORTH
LAKE BONNY
LAKE HUNTER
SADDLE CREEK
TEC 69KV GAPWAY INTERCONNECT
PEF/RIDGE CO-GEN TIE
LAKE HANCOCK
BANANA LAKE
(PURCHASED RIGHT-OF-WAY)
SCOTT LAKE
KEY
A PALMETTO
B GIBSONIA
C COMBEE RD 12KV
D DRANEFIELD
E GROVE
F TENOROC
G GALLOWAY
H HEMPHILL
I CREWSLAKE
J SOUTHWEST
K NORTHWEST
L HIGHLAND CITY
M MEDULLA
N LARSEN
O INTERSTATE
P McINTOSH
Q SOCRUM
R EATON PARK
S SUTTON
T WINSTON
V ORANGEDALE
W WEST
X EAST
Y GLENDALE
Z LAKE MIRROR
CA CHRISTINA
OB OWENS
PX PUBLIX
WDG WINSTON DIST. GEN.
SC SADDLE CREEK
PEF 230KV BARCOLA INTERCONNECT
TEC 69KV SAND HILL INTERCONNECT
TEC 230KV PEBBLEDALE INTERCONNECT
TEC 230KV RECKER INTERCONNECT
MAP 1
CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION (CEII) DO NOT RELEASE - CONFIDENTIAL
LAKELAND ELECTRIC
LAKELAND ELECTRIC SYSTEM - GENERATION TRANSMISSION & SUBSTATION FACILITIES EXISTING 2015
-N-

3.0 Forecast of Electrical Power Demand and Energy Consumption

Annually, Lakeland Electric (LE) develops a detailed short-term (1-year) electric load and energy forecast for budget purposes and short-term operational studies. The annual long-term forecast is developed for the Utility's long-term planning studies.

Sales and customer forecasts of monthly data are prepared by rate classification or revenue class. Separate forecast models are developed for inside and outside Lakeland's corporate limits for the Residential, Commercial, Industrial and outdoor lighting rate classifications. Monthly forecasts are summarized annually using fiscal period ending September 30th.

LE uses MetrixND, an advanced statistical program developed by Itron, to assist with the development of LE's energy, number of customers, and demand forecasts. MetrixND allows LE to incorporate economic, demographic, price, elasticities, end-use appliance saturations and efficiencies, and various weather variables into the forecast.

LE also uses Itron MetrixLT, which integrates with MetrixND, for developing long-term system hourly load forecasts.

Many variables were evaluated for the development of the forecast. The variables that have proven to be significant and are included in the forecast are: Gross State Product (GSP), non-manufacturing employment, total employment, disposable personal income per household, persons per household, growth in number of households, price, structural changes (appliance saturation and efficiency trends), and weather. Binary variables were also used to explain outliers in historical billing discrepancies, trend shifts, monthly seasonality, rate migration between classes, etc.

The economic projections used in this forecast were purchased from Moody's Analytics (Economy.com).

The real price of electricity was developed using a 12-month moving average of real average revenue. The historical price data by class, along with the Consumer Price Index (CPI), was used to develop a price forecast for the MetrixND modeling structure. The end-use saturation and efficiency indices used in the models were purchased from Itron. Itron offers end-use data services and forecasting support through its Energy Forecasting Group (EFG). EFG's projections are based on data derived from the Energy Information Administration's South Atlantic Census Division. Itron was contracted to further calibrate the indices based on LE' service area average square footage by building type.

Heating and cooling degree days are weather variables that attempt to explain a customer's usage behavior as influenced by either hot or cold weather. The industry standard for calculating degree days is: Average Daily Temperature – 65 degrees (base temperature) = Heating or Cooling Degree Day.

These heating and cooling degree day weather variables are used in the forecasting process to correlate electric consumption with weather. The heating and cooling degree days are weighted to capture the impacts of weather on revenue month billed consumption.

LE uses weather data from its own weather stations, which are strategically placed throughout the electric service territory to provide the best estimate of overall temperature for the Lakeland service area. All of the forecast models are developed using historical 20-year normal weather.

Normal temperatures at time of peak are used for peak modeling. Heating and cooling degree days are calculated for each historical monthly peak. Then, the weather variables are ranked from the highest to lowest value within each year. Normal peak day HDD and CDD's are then defined as an average across the rankings. The last step is mapping the average values back to the month during which the highest HDD or CDD typically occurs.

Historical monthly data is available and was analyzed for the 20-year period. However, after careful evaluation of the data and model statistics, most models are typically developed using less than a 10-year estimation period.

The modeling techniques used to generate the forecast include: econometric and multiple regression, study of historical relationships and growth rates, trend analysis, and exponential smoothing. LE also reviews the forecast for reasonableness, compares projections to historical patterns, and modifies the results as needed using informed judgment. LE utilizes Itron's Statistically Adjusted End-Use (SAE) modeling approach for the residential and commercial sectors. The SAE approach is designed to capture the impact of changing end-use saturation and efficiency trends as well as economic conditions on long-term residential and commercial energy sales and demand.

The winter peak forecast is developed under the assumption that its occurrence will be on a January weekday. Historical winter peaks have occurred between the months of January to March, on weekdays, and between the hours of 7 and 8 a.m. Temperatures at time of winter peaks range from 28.5° F to 40.7° F.

The summer peak forecast is developed under the assumption that its occurrences will be on a July weekday. Historical summer peaks have occurred between the months of June to August, on weekdays, and between the hours of 3 and 6 p.m. Temperatures at time of summer peaks range from 94.1° F to 96.1° F.

LE currently does not have any Demand Side Management (DSM); therefore, LE does not assume any deductions in peak load for the forecast period.

The results of the energy sales forecasts for all revenue classes are added together to create a total sales forecast. A loss-factor of approximately 3.5% (based on historical monthly data) is applied to convert total energy sales into net energy for load (NEL).

3.1 Service Territory Population Forecast

Electric Service Territory Population Estimate

LE's service area encompasses approximately 246 square miles of which approximately 174 square miles are outside the City of Lakeland's corporate limits. The estimated electric service territory population for LE for Fiscal Year 2015 is 274,861 persons.

Population Forecast

LE's service territory population is projected to increase at an estimated 1.39% average annual growth rate (AAGR) for Fiscal Years 2016 – 2025.

Polk County's population (Lakeland/Winter-Haven MSA) is growing at 1.52% AAGR for the same 10-year period. Historically, Polk County's population has grown faster than LE's service territory population.

3.2 Account Forecasts

Lakeland forecasts the number of monthly electric accounts for the following categories and subcategories:

- Residential
- Commercial
- Industrial
- Other

3.2.1 Residential Accounts

Regression analysis was used to develop the Residential account forecast using monthly customer data. Total Residential accounts were projected as a function of the number of households in the Lakeland/Winter-Haven Metropolitan Statistical Area (MSA). Binary variables were also used to explain outliers in historical billing data and to account for seasonality.

3.2.2 Commercial Accounts

A regression model was used to develop the Commercial account forecast. The number of commercial accounts were projected as a function of total employment and residential accounts in the Lakeland/Winter Haven Metropolitan Statistical Area (MSA). Binary variables were also used to explain outliers in historical billing data.

3.2.3 Industrial Accounts

The Industrial account category is comprised of those accounts within the General Service Large Demand, Interruptible and Extra Large Demand Customer revenue classes. The Industrial customer class consists of those non-residential customers with a billing demand higher than 500 kW.

Projections for the Industrial accounts were modeled independently of MetrixND. Special consideration was given to account for new major commercial and industrial development projects that may impact future demand and energy requirements.

3.2.4 Other Accounts

The Other account category is comprised of those accounts within the Municipal, Electric, and Water Departments of the City of Lakeland. This category also includes private area lighting and roadway lighting.

Historical data for these classes is very inconsistent and difficult to model. Therefore, the account projections for this category were based on time trends and historical growth rates. LE also took into consideration any future projects and developments. These forecasts were developed outside of MetrixND and were later integrated with the other rate class forecasts to generate the Total Account Forecast.

3.2.5 Total Account Forecast

The Total Account Forecast for LE is the sum of all the individual forecasts mentioned above.

3.3 Energy Sales Forecast

Lakeland's Energy Sales Forecast is the sum of the individual forecasts mentioned below.

LE forecasts monthly energy sales for the following categories and subcategories:

- Residential
- Commercial
- Industrial
- Other

3.3.1 Residential Energy Sales Forecast

The Residential energy sales forecast was developed using the Statistically Adjusted End-Use (SAE) modeling approach. The SAE approach uses regression models and independent variables that are designed to capture the impact of changing end-use saturation and efficiency trends as well as economic conditions on long-term residential energy and demand. The residential sales models are average use models and are estimated with historical monthly energy sales data.

The Residential average use models for inside and outside Lakeland's corporate limits are driven by disposable personal income per household, the number of persons per household, appliance saturation and efficiency trends, and weather. Binary variables were also used to explain outliers in the historical billing data.

The average use regression model is based on the following average use equation:

$$AvgUse_{y,m} = a + b_1 \times XCool_{y,m} + b_2 \times XHeat_{y,m} + b_3 \times XOther_{y,m}$$

<u>*Where:*</u>

XCOO*L* = Cooling equipment saturation levels (central, room), cooling equipment efficiency, thermal efficiency, home size (square footage), household income, average persons per household size, energy price and cooling degree days (CDD).

$$\text{XCool}_{\text{y,m}} = \text{CoolIndex}_{\text{y}} \times \text{CoolUse}_{\text{y,m}}$$

$XCool_{y,m}$ is the estimated cooling energy use in year (y) and month (m).

$CoolIndex_{y,m}$ is the annual index of cooling equipment.

$CoolUse_{y,m}$ is the monthly usage multiplier.

The $CoolIndex_{y,m}$ is calculated as follows:

$$CoolIndex_y = Structural\ Index_y \times \sum_{Type} Weight^{Type} \times \frac{\left(Sat_y^{Type} \big/ Eff_y^{Type} \right)}{\left(Sat_{01}^{Type} \big/ Eff_{01}^{Type} \right)}$$

$CoolUse_{y,m}$ is defined as follows:

$$CoolUse_{y,m} = \left(\frac{CDD_{y,m}}{CDD_{01}} \right) \times \left(\frac{HHSize_{y,m}}{HHSize_{01}} \right)^{0.10} \times \left(\frac{HHIncome_{y,m}}{HHIncome_{01}} \right)^{0.20} \times \left(\frac{\Pr ice_{y,m}}{\Pr ice_{01}} \right)^{0.0}$$

XHEAT = Heating equipment saturation levels (resistance, heat pump), heating efficiency, thermal efficiency, home size (square foot), household income, average persons per household size, energy price and heating degree days (HDD).

$$XHeat_{y,m} = HeatIndex_{y,m} \times HeatUse_{y,m}$$

<u>*Where:*</u>

$XHeat_{y,m}$ is the estimated heating energy use in year (y) and month (m).

$HeatIndex_{y,m}$ is the annual index of heating equipment.

$HeatUse_{y,m}$ is the monthly usage multiplier.

The $HeatIndex_{y,m}$ is calculated as follows:

$$HeatIndex_y = Structural\ Index_y \times \sum_{Type} Weight^{Type} \times \frac{\left(Sat_y^{Type} \big/ Eff_y^{Type} \right)}{\left(Sat_{01}^{Type} \big/ Eff_{01}^{Type} \right)}$$

$HeatUse_{y,m}$ is defined as follows:

$$HeatUse_{y,m} = \left(\frac{HDD_{y,m}}{HDD_{01}} \right) \times \left(\frac{HHSize_{y,m}}{HHSize_{01}} \right)^{0.10} \times \left(\frac{HHIncome_{y,m}}{HHIncome_{01}} \right)^{0.20} \times \left(\frac{Price_{y,m}}{Price_{01}} \right)^{0.0}$$

XOTHER = Other equipment saturation levels (water heat, appliances, lighting densities, plug loads), appliance efficiency, household income and average persons per household size. The explanatory variables for other uses are defined as follows:

$$XOther_{y,m} = OtherIndex_{y,m} \times OtherUse_{y,m}$$

The $OtherIndex_{y,m}$ is calculated as follows:

$$OtherIndex_y = Structural\ Index_y \times \sum_{Type} EI^{Type} \times \frac{\left(Sat_y^{Type} \big/ Eff_y^{Type} \right)}{\left(Sat_{01}^{Type} \big/ Eff_{01}^{Type} \right)}$$

$OtherUse_{y,m}$ is defined as follows:

$$OtherUse_{y,m} = \times \left(\frac{HHSize_{y,m}}{HHSize_{01}} \right)^{0.10} \times \left(\frac{HHIncome_{y,m}}{HHIncome_{01}} \right)^{0.20} \times \left(\frac{Price_{y,m}}{Price_{01}} \right)^{0.0}$$

The equation used to develop residential energy sales is as follows:

$$ResidentialSales_{y,m} = ResidentialCustomer_{y,m} \times AverageUsePerCustomer_{y,m}$$

3.3.2 Commercial Energy Sales

The Commercial energy sales forecasts are also developed using the SAE modeling approach. The modeling framework for the Commercial sector is the same as the Residential sales models.

Commercial energy sales are projected for both inside and outside the corporate limits. The Commercial sales models are driven by: Gross State Product (GSP), weather, and appliance saturations and efficiencies. Binary variables were also used to help explain fluctuations in historical billing data due to rate migrations, billing discrepancies, seasonality, etc.

3.3.3 Industrial Energy Sales

The Industrial customer class demand and energy sales forecasts are modeled independently of MetrixND and later imported into the model to generate the Total Sales Forecast. Each Industrial customer is evaluated individually to account for their expected future energy and demand consumption. Usage data compiled by the utility's Account Managers and the forecasting group, who monitor the activity for LE's largest customers, was also integrated into the forecasting process.

3.3.4 Other Sales Forecast

Other energy sales are comprised of sales for the City's Municipal, Electric and Water Departments, private area lighting, roadway lighting, and unmetered (street lighting) rate classes. Models are very difficult to develop for these rate classes due to the large fluctuations in the historical billing data. Therefore, the projections for this category are based on historical trends and growth rates. Special consideration is given to account for new projects and developments.

3.3.5 Total Sales Forecast

The Total Energy Sales Forecast for Lakeland is the sum of the individual forecasts mentioned above.

3.4 Net Energy for Load Forecast

Models are estimated in MetrixND to forecast monthly sales by customer class (Residential, Commercial, Industrial, Other). The results of the energy sales forecasts for all revenue classes are added together to create a total sales forecast. To determine the total system net energy for load (NEL) a loss-factor was applied to the total sales forecast to convert sales into NEL. Electric losses, the measure of the amount of energy lost during the generation, transmission, and distribution of electricity were developed using a historical average.

3.5 Peak Demand Forecast

A regression model is estimated in MetrixND for forecast monthly peaks. The model is developed using Itron's SAE modeling approach to ensure that end-use appliance saturations and efficiencies that may affect peak are being accounted for. The models are driven by monthly energy coefficients and actual peak-producing weather conditions. The forecast is generated under the assumption of "normal" peak-producing weather conditions. Normal peak-producing weather is developed using historical 20-year normal weather.

3.6 Hourly Load Forecast

Twenty-four hourly regression models were developed in MetrixND to generate the 20-year hourly load forecast. Each of these models relates weather and calendar-conditions (day-of-week, month, holidays, seasonal periods, etc.) to load. The un-calibrated hourly load shape is then scaled to the energy forecast and the peak forecast using MetrixLT. The result is an hourly load shape that is calibrated to the system energy and system peak forecasts produced using MetrixND.

3.7 Sensitivity Cases

3.7.1 High & Low Load Forecast Scenarios

A forecast is generated based on the projections of its drivers and assumptions at the time of forecast development. This base forecast (50/50) is intended to represent the forecast that is “most likely” to occur.

It should be noted, that there may be some conditions arising that may cause variation from what was expected in the base forecast. For these reasons, high and low case scenario forecasts are developed for customers, energy sales, system net energy for load and peaks. The high and low forecasts are based on variations of the primary drivers including population and economic growth.

Model Evaluation and Statistics

The results of the Electric Load and Energy Forecast were reviewed by an outside consultant. Itron was hired to review all sales, customer, peak and energy forecast models for reasonableness and statistical significance. Itron also evaluated and reviewed all key forecast assumptions.

Additionally, the MetrixND software was used to calculate the following list of statistical tests for determining a significant model: Adjusted R-Squared, Durbin Watson Statistic, F-Statistic, Probability (F-Statistic), Mean Absolute Deviation (MAD) and Mean Absolute Percent of Error (MAPE).

4.0 Energy Conservation & Management Programs

Lakeland Electric is committed to the efficient use of electric energy and is committed to provide cost-effective energy conservation and demand reduction programs for all its consumers. Lakeland is not subject to FEECA rules but has in place several Energy Conservation & Management Programs and remains committed to utilize cost-effective conservation and Energy Conservation & Management Programs that will benefit its customers. Presented in this section are the currently active programs.
This section also includes a brief description of Lakeland's advances in solar technology and a new LED traffic light retrofit program. Lakeland has been a pioneer in the deployment and commissioning of solar energy devices and continues to support and look for opportunities to promote solar energy technologies.

4.1 Existing Energy Conservation & Management Programs

Lakeland has the following energy conservation & management programs that are currently available and address two major areas of energy conservation & management:

- Reduction of energy needs on a per customer basis.
- Movement of energy to off-peak hours when it can be generated at a lower cost.

4.1.1 Non-Measurable Demand and Energy Savings

The programs outlined in this section cannot be measured directly in terms of demand and energy savings, but are very important in that they have been shown to influence public behavior and thereby help reduce energy consumption and generation requirements. Lakeland considers the following programs to be an important part of its objective to cost-effectively reduce energy consumption:

- Residential Programs:
  - Energy Audit Program.
  - Public Awareness Program.
  - Informational Bill Inserts.
- Commercial Programs:
  - Commercial Audit Program.

4.1.1.1 Residential Programs.

4.1.1.1.1 Residential Energy Audits.

The Energy Audit Program promotes the usage of high energy-efficiency appliances in the home and gives the customer an opportunity to learn about other utility conservation programs. The program provides Lakeland with a valuable customer interface and a good avenue for increased customer awareness.

4.1.1.1.2 Public Awareness Program.

Lakeland believes that public awareness of the need to conserve electricity is the greatest conservation resource. Lakeland's public awareness programs provide customers with information to help them reduce their electric bills by being more conscientious in their energy usage.

4.1.1.1.3 Informational Bill Inserts.

Monthly billing statements provide an excellent avenue for communicating timely energy conservation information to its customers. In this way, Lakeland conveys the message of better utilizing their electric resources on a regular basis in a low cost manner.

4.1.1.2 Commercial Programs.

4.1.1.2.1 Commercial Energy Audits.

The Lakeland Commercial Audit Program includes educating customers about high efficiency lighting and thermal energy storage devices for customers to consider in their efforts to reduce costs associated with their electric usage.

4.1.2 Energy Conservation & Management Technology Research

Lakeland has made a commitment to study and review promising technologies in the area of energy conservation & management programs. Some of these efforts are summarized below.

4.1.2.1 Time-of-Day Rates.

Lakeland is currently offering a time of day program and plans to continue as this makes consumers aware of the variation in costs during the day. To date, there has been limited interest by Lakeland's customers in this demand-side management program.

4.1.3 Conservation Programs 2016

In keeping with Lakeland Electric's plan to promote retail conservation programs, the utility is continuing the following Energy Efficiency & Conservation Programs during 2016:

Residential

- Insulation rebate - $200 rebate for adding attic insulation to achieve R30 total. Certificate issued to resident at energy audit/visit and redeemed to Insulation Contractor. Can be homeowner installed
- Energy Saving Kits – giveaway at audits contains weather-stripping, outlet gaskets, low flow showerhead, CFL, etc.
- HVAC Maintenance Incentive - $50 rebate for residential customers that have A/C maintenance done.
- Heat Pump Rebate - $300 rebate for installing a SEER 15 or higher heat pump
- LED Lighting – giveaway at audits, up to 3 per residence
- On-line Energy Audit
- Energy Star Appliance Rebate
  - Refrigerator $75
  - Dishwasher $40
  - Clothes Washer $100
  - Freezer $40
  - Pool Pump $200

Commercial

- Conservation Rebate – rebate of $150/kw for GSLD, Contract, and Interruptible customers that make energy efficiency improvements. Promoted by Account Executives
- Commercial Lighting – rebate of $150/kw reduced per customer for energy efficient lighting upgrades

Expected Results

- 1.1 mw demand reduction and over 3,000,000 kwh

4.2 Solar Program Activities

Lakeland Electric views solar energy devices as distributed generators whether they interconnect to the utility grid or not. Solar also contributes to reducing both peak demand and energy, linking it to energy conservation & management programs. As such they can potentially fill the much-desired role that an electric utility needs to avoid future costs of building new (and/or re-working existing) supply side resources and delivery systems.

4.2.1 Solar Powered Street Lights.

Distributed generation produces the energy in end use form at the point of load by the customer, thereby eliminating many of the costs, wastes, pollutants, environmental degradation, and other objections to central station generation.

Solar powered streetlights offer a reliable, cost-effective solution to remote lighting needs. As shown in Figure 4-1, they are completely self-contained, with the ability to generate DC power from photovoltaic modules and batteries. During daylight hours solar energy is stored in the battery bank used to power the lights at night. By installing these self-sufficient, stand-alone solar lighting products, Lakeland Electric was able to avoid the construction costs related to expansion of its distribution system into remote areas. These avoided costs are estimated to be approximately $40,000.

For 13 years Lakeland had 20 solar powered streetlights in service. Each of these lights offset the need for a traditional 70 watt fixture that Lakeland typically would use in this type of application and displaced the equivalent amount of energy that the 70 watt fixture would use on an annual basis. The primary application for this type of lighting is for remote areas as stated above. In 2006, Lakeland's distribution system was developed in the areas where the solar powered streetlights were installed. Lakeland has chosen to phase-out the solar powered streetlights due to their age. Lakeland installed these 20 lights in mid-1994 in a grant program with the cooperation of the Florida Solar Energy Center (FSEC).

Figure 4-1
Solar Powered Streetlight

4.2.2 Solar Thermal Collectors for Water Heating.

The most effective application for solar energy is the heating of water for residential use. Solar water heating provides energy directly to the end-user and results in a high level of end-user awareness. The sun's energy is stored directly in the heated water itself, eliminating the losses incurred when converting the energy to other forms.

During a ten-year pilot program, Lakeland installed and operated 57 solar water heaters in single family homes. Lakeland chose active solar water heaters as well as passive. All units were installed on the roofs of residential customers' homes, i.e. – at the point of consumption. Since this method of energy delivery bypasses the entire transmission and distribution system, there are benefits other than avoided generation costs.

In Lakeland's program, each solar water heater remained the property of the utility, thereby allowing the customer to avoid the financial cost of the purchase. Lakeland's return on this investment was realized through the sale of the solar generated energy as a separate line item on the customer's monthly bill. This energy device was monitored by using a utility-quality Btu meter calibrated to read in kWh.

One of the purposes of this program was to demonstrate that solar thermal energy can be accurately metered and profitably sold to the everyday residential end-user as hot water. Lakeland Electric's fleet of 57 solar thermal energy generators displaces over 2,000 kWh per year per installation on average. During 2012 Lakeland Electric chose to end the pilot program, giving the participants the choice to either:

- assume ownership of the solar heater at no cost (or)
- have the solar heater removed and replaced with a standard electric water heater, also at no cost.

Sixty-two percent of the participants chose to keep the solar heaters at their premises.

4.2.3 Renewable Energy Credit Trading

Lakeland Electric is also the first utility to successfully trade Renewable Energy Credits (REC's) that were produced by these solar water heaters. In 2004 a cash transaction took place between Lakeland and two REC buyers: Keys Energy Services of Key West and the Democratic National Convention in Boston. Keys Energy needed the REC's for its retail Green Pricing program. The Democratic National Convention used the REC's to offset the emissions produced during that convention.

4.2.4 Utility Expansion of Solar Water Heating Program

During November, 2007 Lakeland Electric issued a Request for Proposals for the expansion of its Residential Solar Water Heating Program. In this solicitation Lakeland sought the services of a venture capital investor who would purchase, install, own, operate and maintain 3,000 – 10,000 solar water heaters on Lakeland Electric customers' residences in return for a revenue-sharing agreement. Lakeland Electric would provide customer service and marketing support, along with meter reading, billing and collections. During December, 2007 a successful bidder was identified and notified. In August 2009, Lakeland Electric approved a contract with the vendor with plans to resume installations of solar water heaters. Annual projected energy savings from this project will range between 7,500 and 25,000 megawatt-hours. These solar generators will also produce Renewable Energy Credits that will contribute toward Florida's expected mandate for renewable energy as a part of the utility's energy portfolio.

During the summer of 2010 the "Solar for Lakeland" program began installing residential solar water heaters. Under this expanded program the solar thermal energy will be sold for the fixed monthly amount of $34.95. All solar heating systems will continue to be metered for customers' verification of solar operation and for tracking green credits for the utility. Through the end of 2015 there were 221 solar heaters installed in Lakeland residences.

4.2.5 Utility-Interactive Net Metered Photovoltaic Systems

This project started as a collaborative effort between the Florida Energy Office (FEO), Florida Solar Energy Center (FSEC), Lakeland Electric, and Shell Solar Industries. The primary objective of this program was to develop approaches and designs that integrate photovoltaic (PV) arrays into residential buildings, and to develop workable approaches to interconnect PV systems into the utility grid. Lakeland originally installed 3 PV systems, all of which were directly interconnected to the utility grid. These systems have an average nominal power rating of approximately 2.6 kilowatts peak (kwp) and are displacing approximately 2900 kWh per year per installation at standard test conditions.

During 2005 title to these systems was transferred to those homeowners in return for their extended voluntary participation. At the end of 2015 only one of these three original systems was still in operation.

Lakeland owned, operated, and maintained the systems for at least 7 years. FSEC conducted periodic site visits for testing and evaluation purposes. System performance data was continuously collected via telephone modem line during those years. FSEC prepared technical reports on system performance evaluation, onsite utilization, coincidence of PV generation with demand profiles, and utilization of PV generated electricity as a demand-side management option.

After 2015 there were a total of 139 PV systems that had been privately purchased in the Lakeland Electric service territory. These systems now generate a total of 676 kw of electric capacity. Lakeland Electric has allowed the interconnection of these systems in “net meter” fashion.

4.2.6 Utility-Interactive Photovoltaic Systems on Polk County Schools

Lakeland was also actively involved in a program called "Portable Power." The focus of the program was to install Photovoltaic Systems on portable classrooms in the Polk County School District. This program included Lakeland Electric, Polk County School District, Shell Solar Industries, Florida Solar Energy Research and Education Foundation (FSEREF), Florida Solar Energy Center (FSEC) and the Solar Electric Power Association (SEPA), formerly known as the Utility Photovoltaic Group. The program allowed seventeen portable classrooms to be enrolled in former President Clinton's "Million Solar Roofs Initiative." With the installation of the photovoltaic systems 80 percent of the electricity requirements for these classrooms were met.

Along with the photovoltaic systems, a specially designed curriculum on solar energy appropriate to various grade levels was developed. This education package was delivered to the schools for their teachers' use for the instruction of solar sciences. By addressing solar energy technologies in today's public school classrooms, Lakeland is informing the next generation of the environmental and economic need for alternate forms of energy production.

The "Portable Power" in the schools, shown in Figure 4-2, consisted of 1.8kWp photovoltaic systems on 17 portable classrooms. In addition to the educational awareness benefits of photovoltaic programs in schools, there were several practical reasons why portable classrooms were most appropriate as the platforms for photovoltaics. They provided nearly flat roofs and were installed in open spaces, so final orientation is of little consequence. Another reason was the primary electric load of the portable classroom was air conditioning. That load was reduced by the shading effect of the panels on their short stand-off mounts. Most important, the total electric load of the portable classroom was highly coincidental with the output from the PV system. The hot, sunny days which resulted in the highest cooling requirements also produced the maximum PV output.

Of extreme value to the photovoltaic industry, Lakeland Electric, in a partnership with the FSEC, provided on-site training sessions while installing the solar equipment on these school buildings. Attendees from other electric utilities were enrolled and given a hands-on opportunity to develop the technical and business skills needed to implement their own solar energy projects. The training classes covered all aspects of the solar photovoltaic experience from system design and assembly, safety and reliability, power quality, troubleshooting to distributed generation, and future requirements of deregulation.

Figure 4-2
Portable Classroom Topped by PV Panels

Lakeland owned, operated, and maintained the systems on these classrooms. Lakeland monitored the performance and FSEC conducted periodic testing of the equipment. Through the cooperative effort of the partnership, different ways to use a photovoltaic system efficiently and effectively in today's society were evaluated.

As a result of aging, all of the portable classrooms have been retired. And, where shifting populations have caused school officials to relocate some classrooms to schools outside Lakeland's service territory, Lakeland has removed the PV systems from those classrooms. Because the equipment is still capable of generating, budgets are being created so that these systems can be re-installed on buildings owned by the City of Lakeland.

4.2.7 Integrated Photovoltaics for Florida Residences

Lakeland's existing integrated photovoltaic program supports former President Clinton's "Million Solar Roofs Initiative". The Department of Energy granted five million dollars for solar electric businesses in addition to the existing privately funded twenty-seven million dollars, for a total of thirty-two million dollars for the program. Through the Utility Photovoltaic Group, the investment supported 1,000 PV systems in 12 states and Puerto Rico with hopes to bring photovoltaic systems to the main market. The 1,000 systems were part of the 500,000 commitments received for the initiative to date. The goal was to have installed solar devices on one million roofs by the year 2010. Lakeland helped to accomplish this national goal.

This program provides research in the integration of photovoltaics in newly constructed homes. Two new homes, having identical floor plans, were built in "side-by-side" fashion. The dwellings were measured for performance under two conditions: occupied and unoccupied. Data is being collected for end-use load and PV system interface. As a research project, the goal is to see how much energy could be saved without factoring in the cost of the efficiency features.

The first solar home was unveiled on May 28, 1998, in Lakeland, Florida. The home construction includes a 4 kW photovoltaic system, white tiled roof, argon filled windows, exterior wall insulation, improved interior duct system, high performance heat pump and high efficiency appliances. An identical home with strictly conventional construction features was also built as a control home. The homes are 1 block apart and oriented in the same direction as shown in Figure 4-3. For the month of July 1998, the occupied solar home air conditioning consumption was 72 percent lower than the unoccupied control house. Living conditions were simulated in the unoccupied home. With regard to total power, the solar home used 50 percent less electricity than the air conditioning consumption of the control home. The solar home was designed to provide enough power during the utility peak that it would not place a net demand on the grid. If the solar home produces more energy than what is being consumed on the premises, the output of the photovoltaic system could be sent into the utility grid. The objective was to test the feasibility of constructing a new, single family residence that was engineered to reduce air conditioning loads to an absolute minimum so most of the cooling and other daytime electrical needs could be accomplished by the PV component.

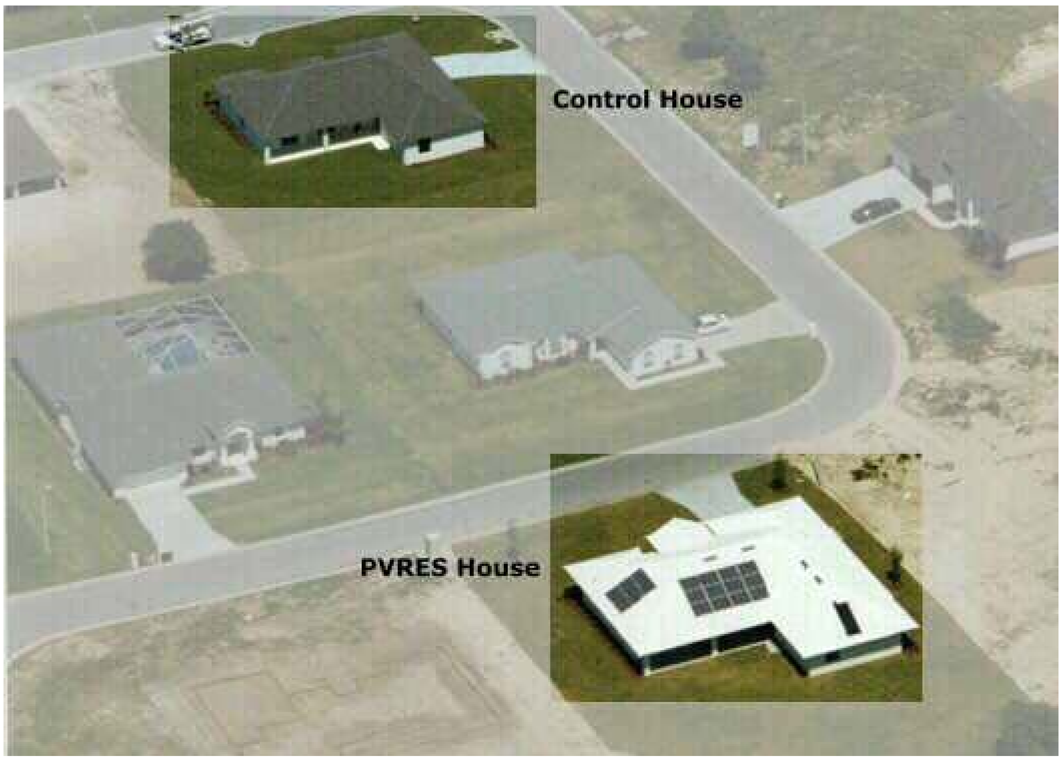


Figure 4-3
Solar House and Control House

4.2.8 Utility-Scale Solar Photovoltaic Program

During November, 2007 Lakeland Electric issued a Request for Proposal seeking an investor to purchase and install investor-owned PV systems totaling 24 megawatts on customer-owned sites as well as City of Lakeland properties. During December, 2007 a successful bidder was identified. In October 2008, Lakeland Electric approved the contract with the vendor. Installation of these PV systems began in 2010. Projected reduction in annual fossil-fuel generation is expected to be 31,800 megawatt-hours. This project will not only offset future energy generation, but will also produce highly valuable Renewable Energy Credits in anticipation of a Florida mandate to produce renewable energy as a part of the utility's overall portfolio.

During 2010 an investor-owned 250kw PV system was installed on the roof of Lakeland's Civic Center. This system became operational during March and has produced a total of 2,470 MWh through 2015.

During 2011 a 2.3 megawatt PV system (Phase 1) was installed at the Lakeland Linder Airport. This system is interconnected directly to the utility's medium voltage distribution circuit on Hamilton Road. This system has generated a total of 18,540 MWh through the end of 2015.

During 2012, another 3.0 megawatt PV system (Phase 2) was added to the Hamilton Road site bringing the project total to 5.3 MWac. The Phase 2 system has generated 20,560 MWh through 2015.

In December of 2013 LE entered into another Solar Energy Purchase Agreement with this vendor. This agreement calls for the construction of a 6.0 MWac solar generation system on property adjacent to the Sutton substation. This system was completed and commissioned during July 2015. This system generated a total of 5,910 MWh through the end of 2015.

During October of 2015, another 3.15 MW project was started on Lakeland Airport property at Medulla Rd. This project is scheduled for completion in February, 2016. Plans call for the development of another 6.0 MW to be constructed during 2016. Specifications will become available during the first half of the year. Upon successful completion of these projects, Lakeland Electric will have a total of ~21 MW of solar capacity and will produce approximately 3.5% of the average daytime system-wide summer load.

4.2.9 Community Solar

Community Solar programs provide an alternative to the traditional process of individuals or businesses placing solar on their property. In this program LE's customers will have the choice of purchasing solar energy from a designated solar generation facility instead of a traditional power plant.

Joining other utilities across the United States, LE has chosen *Community Solar* as a mean to increase participation in solar energy for the people who may have physical, financial, or other limitations to installing solar on their own property.

During the second half of 2015, Lakeland Electric conducted telephone surveys and held focus group meetings to determine the level of interest in a *Community Solar* Program. Program specifics and policies are expected to be developed in 2016. A rollout date for this program was not determined at the end of 2015.

4.3 Green Pricing Program

Because no long-term budgets have been established for the deployment of solar energy devices, many utilities are dependent on infrequent, somewhat unreliable sources of funding for their solar hardware purchases. To provide for a more regularly available budget, a number of utilities are looking into the voluntary participation of their customers. Recent market studies performed in numerous locations and among diverse population groups reveal a public willingness to pay equal or even slightly higher energy prices knowing that their payments are being directed towards renewable fuels.

The Florida Municipal Electric Association (FMEA) has assembled a workgroup called "Sunsmart". This workgroup is a committee composed of member utilities.

Its purpose is to raise environmental awareness and implement "Green Pricing" programs that would call for regular periodic payments from customers who wish to invest in renewables. The Florida Solar Energy Center (FSEC) co-hosts this effort by providing meeting places and website advertising to recruit from statewide responses. A grant from the State of Florida Department of Community Affairs, Florida Energy Office has been appropriated to encourage utility involvement with Green Pricing. Lakeland Electric is an active member of this committee and is investigating the marketability and public acceptance of a Green Pricing Program in its service territory.

4.4 LED Traffic Light Retrofit Program

The City of Lakeland is responsible for the operation and maintenance of 3,411 traffic lights at over 171 intersections. Historically, these traffic signals have used incandescent bulbs which are replaced every 18 months and use approximately 135 watts of electricity per bulb. This amounts to an annual electrical consumption of 1,633,525 kwh for all 12" red and green signals, arrow signals and pedestrian crossing signals.

This project retrofitted the existing bulbs with highly efficient Light Emitting Diodes (LEDs). The LEDs use approximately 10 watts of energy which is more than a 90% decrease in energy consumption as compared to their incandescent counterparts and have a longer life span, up to seven years, which reduces maintenance costs as well.

The Florida Department of Transportation (FDOT) agreed to help fund Lakeland's project to retrofit the signals. The FDOT contributed $50,000 for these new LED traffic lamps on all roadways within Lakeland's city limits. The FDOT views this as a "good neighbor policy" since FDOT depends on city crews to maintain the signals on its roads and highways within the city's limits.

The project began in December, 2002 and was completed in June 2003. The project is expected to save the City of Lakeland $150,000 per year in maintenance and electricity costs.

As a next step, Lakeland Electric added backup power supply equipment at 14 critical intersections earmarked for FDOT-funded LED signals. These improvements were limited to those intersections that are located on state-funded roadways. The UPS systems will improve safety by keeping traffic signals operating during power outages and accidents. Emergency vehicles in Lakeland will see the added benefit of having easier access to desired areas such as fire and medical locations. Lakeland anticipates being one of the first cities in Florida to have the UPS systems applied to the LED signals.

5.0 Forecasting Methods and Procedures

This section describes and presents Lakeland's long-term integrated resource planning process, the economic parameter assumptions, plus the fuel price projections being used in the current evaluation process.

5.1 Integrated Resource Planning

Lakeland selects its capacity resources through an integrated resource planning process. Lakeland's planning process considers energy conservation, and supply-side resources along with the needs of the T&D system. The integrated resource planning process employed by Lakeland continuously monitors supply and energy conservation programs. As promising alternatives emerge, they are included in the evaluation process.

5.2 Florida Municipal Power Pool

Lakeland is a member of the Florida Municipal Power Pool (FMPP) along with the Orlando Utilities Commission (OUC) and the Florida Municipal Power Agency's (FMPA) All-Requirements Power Supply Project. The three utilities operate as one control area. All FMPP capacity resources are committed and dispatched together from the OUC Operations Center.

The FMPP is not a capacity pool meaning that each member must plan for and maintain sufficient capacity to meet their own individual demands and reserve obligations. Any member of the FMPP can withdraw from FMPP with three year written notice. Lakeland, therefore, must ultimately plan to meet its own load and reserve requirements as reflected in this document.

5.3 Economic Parameters and Evaluation Criteria

This section presents the assumed values adopted for economic parameters and inputs used in Lakeland's planning process. The assumptions stated in this section are applied consistently throughout this document. Subsection 5.3.1 outlines the basic economic assumptions. Subsections 5.3.2 and 5.3.3 outline the constant differential fuel forecasts, and base case, high and low.

5.3.1 Economic Parameters

This section presents the values assumed for the economic parameters currently being used in Lakeland's least-cost planning analysis.

5.3.1.1 Inflation and Escalation Rates

The general inflation rate applied is assumed to be 2.0 percent per year based on the CBO's projection for the GDP deflator as of January 2016. A 1.5 escalation rate is applied to operation and maintenance (O&M) expenses. Fuel price escalation rates are discussed below in Section 5.3.2.

5.3.1.2 Bond Interest Rate

Consistent with the traditional tax exempt financing approach used by Lakeland, the self-owned supply-side alternatives assume 100 percent debt financing. Lakeland's long-term tax exempt bond interest rate is assumed to be 4.5 percent.

5.3.1.3 Present Worth Discount Rate

The present worth discount rate used in the analysis is set equal to Lakeland's assumed bond interest rate of 4.5 percent.

5.3.1.4 Interest During Construction

During construction of the plant, progress payments will be made to the EPC contractor and interest charges will accrue on loan draw downs. The interest during construction rate is assumed to be 4.5 percent.

5.3.1.5 Fixed Charge Rates

The fixed charge rate is the sum of the project fixed charges as a percent of the project's total initial capital cost. When the fixed charge rate is applied to the initial investment, the product equals the revenue requirements needed to offset fixed costs for a given year. A separate fixed charge rate can be calculated and applied to each year of an economic analysis, but it is most common to use a Levelized Fixed Charge Rate that has the same present value as the year by year fixed charged rates. Included in the fix charged rate calculation is an assumed 2.0 percent issuance fee, a 1.0 percent annual insurance cost, and a 6-month debt reserve fund earning interest at a rate equal to the bond interest rate.

5.3.2 Fuel Price Projections

This section presents the fuel price projections for coal, natural gas and oil. The fuel price forecast for solid fuels and oils and natural gas is prepared by Lakeland Electric's Fuels Department. The coal commodity escalation rate is .8% base off the 2015 U.S. Energy Information Administration (EIA) forecast. Transportation inflation rate is base off the January 2016 Congressional Budget Office (CBO) GDP inflation rate of 2%. Natural Gas forecast uses the February 2016 ten year NYMEX Natural Gas forward curve along with including the following: transport rate, usage, fuel to provide a total delivered price. The Oil prices use the ten year NYMEX Crude Oil forward curve. The diesel oil forecast is based off the EIA Annual Energy Outlook 2015 Table: Energy prices by Sector and Source.

5.3.2.1 Natural Gas

Natural gas is a colorless, odorless fuel that burns cleaner than many other traditional fossil fuels. Natural gas can be used for heating, cooling, and production of electricity, and other industrial uses.

Natural gas is found in the Earth's crust. Once the gas is brought to the surface, it is refined to remove impurities such as water, sand, and other gases. The natural gas is then transported through pipelines and delivered to the customer either directly from the pipeline or through a distribution company or utility.

Table 5-1
Base Case Fuel Price Forecast Summary

	McIntosh 3 Coal[1]	Natural Gas[1]	Low Sulfur #6 Oil[1]	#2 Diesel Oil[1]
2016	$2.73	$2.15	$6.38	$18.16
2017	$2.76	$2.58	$7.30	$18.22
2018	$2.80	$2.73	$7.73	$18.23
2019	$2.85	$2.78	$8.04	$18.52
2020	$2.89	$2.88	$8.34	$18.78
2021	$2.93	$3.00	$8.47	$19.17
2022	$2.97	$3.14	$8.96	$19.58
2023	$3.01	$3.29	$9.57	$20.02
2024	$3.06	$3.43	$10.06	$20.46
2025	$3.10	$3.59	$10.74	$20.93
Average Growth Rate	1.4%	5.9%	6.0%	1.6%

[1]Prices represent delivered prices

5.3.2.1.1 Natural gas supply and availability

Significant natural gas reserves exist, both in the United States and throughout the North American mainland and coastal regions. Natural gas reserves are mostly dependent on domestic production. Increasing production of natural gas from the

Marcellus shale and advance drilling technology has lower mining cost contributing to increase supply which reduces price volatility seen in recent years. Recent periods have experienced gas trading below $3.00 per MMBtu and the six year NYMEX Natural Gas forward curve is projecting this trend to remain.

5.3.2.1.2 Natural gas transportation

There are now two transportation companies serving Peninsular Florida, Florida Gas Transmission Company (FGT) and Gulfstream. Lakeland Electric has interconnections and service agreements with both companies to provide diversification and competition in delivery.

5.3.2.1.2.1 Florida Gas Transmission Company

FGT is an open access interstate pipeline company transporting natural gas for third parties through its 5,000-mile pipeline system extending from South Texas to Miami, Florida.

The FGT pipeline system accesses a diversity of natural gas supply regions, including:

- Anadarko Basin (Texas, Oklahoma, and Kansas).
- Arkona Basin (Oklahoma and Arkansas).
- Texas and Louisiana Gulf Areas (Gulf of Mexico).
- Black Warrior Basin (Mississippi and Alabama).
- Louisiana – Mississippi – Alabama Salt Basin.
- Mobile Bay

FGT's total receipt point capacity is in excess of 3.0 billion cubic feet per day and includes connections with 10 interstate and 10 intrastate pipelines to facilitate transfers of natural gas into its pipeline system. FGT reports a current delivery capability to Peninsular Florida of approximately 3.1 billion cubic feet per day.

5.3.2.1.2.2 Florida Gas Transmission market area pipeline system

FGT's total receipt point capacity is in excess of 3.0 billion cubic feet per day and includes connections with 10 interstate and 10 intrastate pipelines to facilitate transfers of natural gas into its pipeline system. Lakeland Electric currently has in excess of 28,000 MMBtu / day of firm transportation contracted with FGT for natural gas delivery to Lakeland Electric's generation facilities.

The FGT multiple pipeline system corridor enters the Florida Panhandle in northern Escambia County and runs easterly to a point in southwestern Clay County, where the pipeline corridor turns southerly to pass west of the Orlando area. The mainline corridor then turns to the southeast to a point in southern Brevard County, where it turns south generally paralleling Interstate Highway 95 to the Miami area. A major lateral line (the St. Petersburg Lateral) extends from a junction point in southern Orange County westerly to terminate in the Tampa, St Petersburg, and Sarasota area. A major loop corridor (the West Leg Pipeline) branches from the mainline corridor in southeastern Suwannee County to run southward through western Peninsular Florida to connect to the St. Petersburg Lateral system in northeastern Hillsborough County. Each of the above major corridors includes stretches of multiple pipelines (loops) to provide flow redundancy and transport capability. Numerous lateral pipelines extend from the major corridors to serve major local distribution systems and industrial/utility customers.

FGT's Phase VIII Expansion Project came into full operation April 1, 2011. It consists of approximately 483.2 miles of multi diameter pipeline in Alabama, Mississippi and Florida with approximately 365.8 miles built parallel to existing pipelines. The project added 213,600 horsepower of additional mainline compression. One new compressor station was built in Highlands County, Fla. The project provides an annual average of 820,000 MMbtu/day of additional firm transportation capacity. Currently, Lakeland has no plans to purchase additional pipeline capacity.

5.3.2.1.2.3 Gulfstream pipeline

The Gulfstream pipeline is a 744-mile pipeline originating in the Mobile Bay region and crossing the Gulf of Mexico to a landfall in Manatee County (south Tampa Bay). The pipeline supplies Florida with up to 1.1 billion cubic feet of gas per day serving existing and prospective electric generation and industrial projects in southern Florida. Figure 5-1 shows the route for the Gulfstream pipeline. Phase I of the pipeline is complete and ends in Polk County, Florida. The pipeline extends to FP&L's Martin Plant. Construction for the Gulfstream pipeline began in 2001 and it was placed in service in May, 2002. Phase II was completed in 2005.

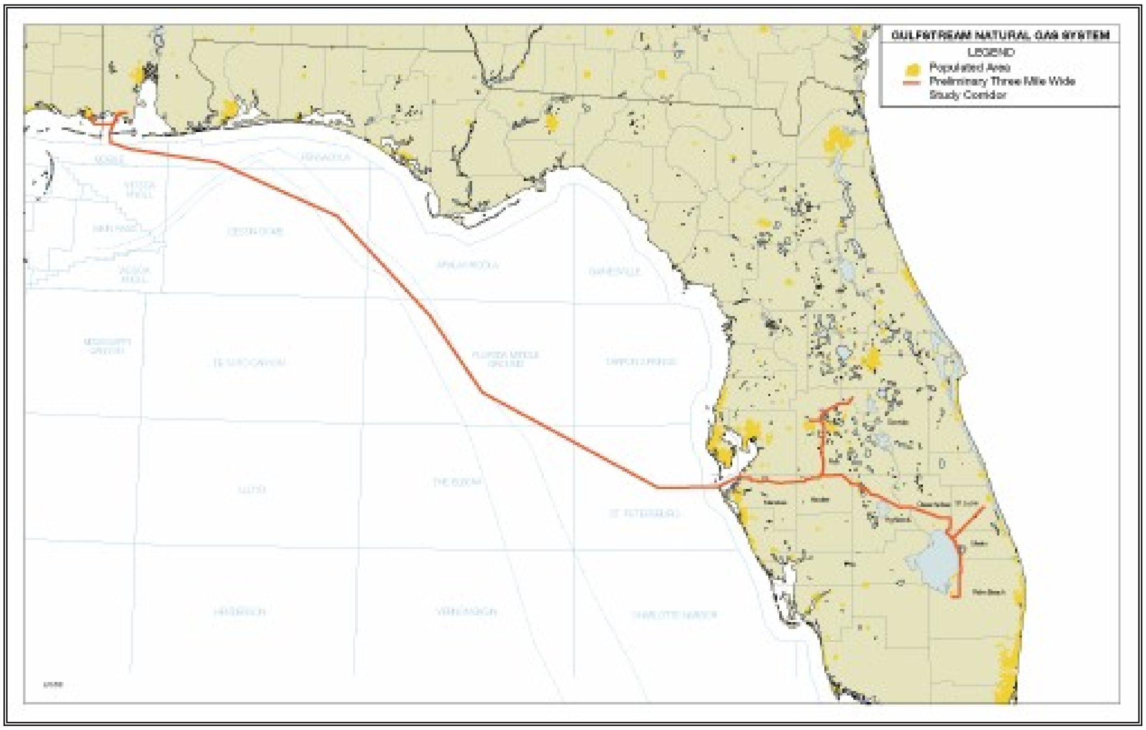


Figure 5-1
Gulfstream Natural Gas Pipeline

5.3.2.1.3 Natural gas price forecast

The price forecast for natural gas is based on historical experience and future expectations for the market. The forecast takes into account the spot purchases of gas to meet its needs along with its risk management holdings intended to reduce price volatility. To address the historic volatility of the natural gas market, Lakeland Electric initiated a formal fuels hedging program in 2003. The Energy Authority (TEA), a company located in Jacksonville, FL, is Lakeland's consultant assisting in the administration and adjustment of policies and procedures as well as the oversight of the program.

Lakeland purchases "seasonal" gas to supplement the base requirement and purchase "as needed" daily gas, known commonly as "spot gas", to round out its supply needs.

Natural gas transportation from FGT is currently supplied under three rates in FGT's tariff, FTS-1, FTS-2 and FTS-3. Rates in FTS-1 are based on FGT's Phase II expansion and rates in FTS-2 are based on the Phase III expansion. Rates in FTS-3 are based on the Phase VIII expansion, which went in service April 1, 2011[1]. The FTS-1 and

[1] Lakeland does not currently subscribe to any FTS-3 capacity.

FTS-2 rates have the same reservation rate but the FTS-2 has a $0.10 surcharge added to it effective February 1, 2016 for sixty-six months as part of the November 2014 rate case settlement. Rates for the Phase IV, Phase V, and Phase VI are included in the FTS-2 rate structure. Transportation rates are reflected in Table 5-2. Once the surcharge expires, the FTS-1 and FTS-2 rate classes will merge as a result of the settlement of FGT's rate case. Lakeland's rate for FGT transportation decreased on an overall basis as a result of the rate case lowering the FTS-2 rate which Lakeland owns 67% of its FGT capacity proving a savings to our ratepayers. The FGT tariff rates became effective, February 1, 2016.

Table 5-2
Natural Gas Tariff Transportation Rates

		Rate Schedules				
Rates And Surcharges	FGT FTS-1 w/surcharges (cents/DTH)*	FGT FTS-2 w/surcharges (cents/DTH)*	**FGT FTS-3 w/surcharges (cents/DTH)*	FGT ITS-1	Gulfstream FTS-1	Gulfstream FTS-6%
Reservation	55.18	65.18	132.99	97.05	55.00	70.41
Usage	3.63	3.63	2.30	0.00	0.02	0.0055
Total	58.81	68.81	135.29	97.05	55.02	70.4155
Fuel Charge	3.29%	3.29%	3.29%	3.29%	1.70%	1.70%

* A DTH is equivalent to 1 MMBtu or 1 MCF
** Lakeland does not currently subscribe to any FTS-3 Capacity

A combination rate of $0.62/MMBtu will be used for purposes of projecting delivered gas prices, transportation charges applied to existing units as this is the average cost for Lakeland to obtain natural gas transportation for those units. This average rate is realized through a current mix of FTS-1, FTS-2 and Gulfstream transportation, including consideration of Lakeland's ability to relinquish its FTS and Gulfstream transportation or acquire other firm and interruptible gas transportation on the market.

5.3.2.2 Coal

Coal is a long-standing and reliable fuel used primarily for electric generation. Lakeland's McIntosh Unit #3 is a 365 megawatt coal burning generator placed into service in the early 1980's.

5.3.2.2.1 Coal supply and availability

Lakeland's current coal purchase contract equals approximately 77 percent of Lakeland Electric's annual requirements for calendar 2016. Under normal supply conditions, Lakeland maintains a 30 – 60 day coal supply reserve (60,000 –120,000 tons).

5.3.2.2.2 Coal transportation

McIntosh Unit 3 is Lakeland's only unit burning coal. Lakeland projects McIntosh Unit 3 will burn approximately 600,000 tons of coal per year. The coal sources are located in southwest Indiana, western Kentucky, and southern Illinois, which affords Lakeland multiple transportation options by water or a single rail line haul via CSX Transportation. Lakeland at times may also imports a portion of its coal needs from South American sources, primarily from the nation of Colombia. Coal transportation for U.S. rail origins is provided under a contract signed with CSX in late 2014, which expires on December 31, 2016.

5.3.2.2.3 Coal price forecast

Currently, Lakeland's term purchase of coal for McIntosh 3 is effective through February 2017. Coal prices are expected to continue declining this year with stable IB pricing with modest to no price increases. The plant is pursuing low sulfur, low mercury, and low chlorine to meet EPA regulations for the fuel.

5.3.2.3 Fuel Oil

5.3.2.3.1 Fuel oil supply and availability

The City of Lakeland obtains all fuel oil through spot market purchases and has no long-term contracts. This strategy provides the lowest cost for fuel oil consistent with usage, current price stabilization, and on-site storage. Lakeland's Fuels Section continually monitors the cost-effectiveness of spot market purchasing.

5.3.2.3.2 Fuel oil transportation

Although the City of Lakeland is not a large consumer of fuel oils, a small amount is consumed during operations for backup fuel and diesel unit operations. Fuel oil is transported to Lakeland by truck.

5.3.2.3.3 Fuel oil price forecast

Changes in production levels and methods are placing oil prices at a lower level in the world market. Lakeland adjusts its oil price forecast to reflect current market pricing and what the anticipated future price may be.

5.3.3 Fuel Forecast Sensitivities

Lakeland is not presenting specific forecasted fuel price sensitivities.

6.0 Forecast of Facilities Requirements

6.1 Need for Capacity

This section addresses the need for additional electric capacity to serve Lakeland's electric customers in the future. The need for capacity is based on Lakeland's load forecast, reserve margin requirements, power sales contracts, existing generating and unit capability and scheduled retirements of generating units.

6.1.1 Load Forecast

The load forecast described in Section 3.0 is used to determine the need for capacity. A summary of the load forecast for winter and summer peak demand for base high, and low projections are provided in Section 9.

6.1.2 Reserve Requirements

Prudent utility planning requires that utilities secure firm generating resources over and above the expected peak system demand to account for unanticipated demand levels and supply constraints. Several methods of estimating the appropriate level of reserve capacity are used. A commonly used approach is the reserve margin method, which is calculated as follows:

$$\frac{\text{system net capacity - system net peak demand}}{\text{system net peak demand}}$$

Lakeland has looked at probabilistic approaches to determine its reliability needs in the past. These have included indices such as Loss of Load Probability (LOLP) and Energy Use Efficiency (EUE). Lakeland has found that due to the strength of its transmission system, assisted LOLP or EUE values were so small that reserves based on those measures would be nearly non-existent. Conversely, isolated probabilistic values come out overly pessimistic calling for excessively high levels of reserves due to approximately 50% of Lakeland’s capacity being made up by only two units. As a result, Lakeland has stayed with the reserve margin method based on the equation presented above. When combined with regular review of unit performance at times of peak, Lakeland finds reserve margin to be the proper reliability measure for its system.

Generation availability is reviewed annually and is found to be within industry standards for the types of units that Lakeland has in its fleet, indicating adequate and prudent maintenance is taking place. Lakeland’s winter and summer reserve margin target is currently 15%. This complies with the FRCC reserve margin criteria for the FRCC Region. As Lakeland’s needs and fleet of resources continue to change through time, reserve margin levels will be reviewed and adjusted as appropriate.

6.1.3 Additional Capacity Requirements

By comparing the load forecast plus reserves with firm supply, the additional capacity required on a system over time can be identified. Lakeland's requirements for additional capacity are presented in Tables 6-1 and 6-2 which show the projected reliability levels for winter and summer base case load demands, respectively. Lakeland’s capacity requirements are driven by the base winter peak demand forecasts.

The last column of tables 6-1 and 6-2 indicate that using the base winter and summer forecast, Lakeland will not need any additional capacity in the current ten year planning cycle.

Table 6-1

Projected Reliability Levels - Winter / Base Case

Year	Net Generating Capacity (MW)	Net System Purchases (MW)	Net System Sales (MW)	Net System Capacity (MW)	System Peak Demand: Before Interruptible and Load Management (MW)	System Peak Demand: After Interruptible and Load Management (MW)	Reserve Margin: Before Interruptible and Load Management (%)	Reserve Margin: After Interruptible and Load Management (%)	Excess/ (Deficit) to Maintain 15% Reserve Margin: Before Interruptible and Load Management (MW)	Excess/ (Deficit) to Maintain 15% Reserve Margin: After Interruptible and Load Management (MW)
2016/17	890	0	0	890	679	679	31.1	31.1	109	109
2017/18	890	0	0	890	690	690	29.0	29.0	97	97
2018/19	890	0	0	890	700	700	27.1	27.1	85	85
2019/20	890	0	0	890	702	702	26.8	26.8	83	83
2020/21	890	0	0	890	702	702	26.8	26.8	83	83
2021/22	890	0	0	890	707	707	25.9	25.9	77	77
2022/23	890	0	0	890	711	711	25.2	25.2	72	72
2023/24	890	0	0	890	718	718	24.0	24.0	64	64
2024/25	890	0	0	890	721	721	23.4	23.4	61	61
2025/26	890	0	0	890	726	726	22.6	22.6	55	55

Table 6-2
Projected Reliability Levels - Summer / Base Case

Year	Net Generating Capacity (MW)	Net System Purchases (MW)	Net System Sales (MW)	Net System Capacity (MW)	System Peak Demand		Reserve Margin		Excess/ (Deficit) to Maintain 15% Reserve Margin	
					Before Interruptible and Load Management (MW)	After Interruptible and Load Management (MW)	Before Interruptible and Load Management (%)	After Interruptible and Load Management (%)	Before Interruptible and Load Management (MW)	After Interruptible and Load Management (MW)
2016	844	0	0	844	640	640	31.9	31.9	108	108
2017	844	0	0	844	648	648	30.2	30.2	99	99
2018	844	0	0	844	662	662	27.5	27.5	83	83
2019	844	0	0	844	669	669	26.2	26.2	75	75
2020	844	0	0	844	673	673	25.4	25.4	70	70
2021	844	0	0	844	677	677	24.7	24.7	65	65
2022	844	0	0	844	683	683	23.6	23.6	59	59
2023	844	0	0	844	689	689	22.5	22.5	52	52
2024	844	0	0	844	695	695	21.4	21.4	45	45
2025	844	0	0	844	701	701	20.4	20.4	38	38

7.0 Generation Expansion

As shown in Section 6 and again in the Tables in Section 9, Lakeland does not have an immediate capacity need in the current ten year planning horizon. Therefore, there is no plan to have new resources in generation expansion plan. This gives Lakeland the ability to continue its evaluation of its resource options along with existing resources and the proper mix of existing and/or new resources. Outside of the retirement of our McIntosh Unit 1- as of December 31, 2015, LE currently has no plan to retire any of its existing resources. Additionally, the slower growth in current and projected future demand allows for the delay in generation need. The slower growth in LE's demand forecast (relative to previous forecasts) could be due to shifts in customer behavior (voluntary conservation), increase in government efficiency standards, and limited customer growth, etc. The demand and capacity analysis presented in Section 6 indicates that no generation expansion plan is required for the current planning cycle.

7.1 Reliability and Security of Power Supply

The purpose of the Generation Expansion Plan is to maintain Reliable Supply Portfolio in a system. Even with Lakeland having no immediate plan for resources addition, reliability is the number one priority while operating its generating resources. At any time during the year, the generating resources of the utility can be in planned or forced outages and existing available resources may not be able to meet the customers' demand. In that aspect, Lakeland Electric is in mutual agreement with other FMPP members (i.e., OUC and FMPA) to dispatch all available members' generating resources to meet the total energy demand of each member.

In addition, FRCC, as per the NERC criteria, requires its member utilities to have operating reserve capacity (contingency reserves) to maintain the continuous supply and demand balance. This is required to provide voltage regulation, load forecast error, equipment outage, and local system protection as per FRCC's reliability standard (i.e., NERC standard BAL-002-0) requirement. In this context, FMPP, as a representative for

Lakeland Electric, uses our power exchange agreements with other neighboring utilities (such as, Duke Energy, TECO, and FP&L) than encompasses 10 different Balancing Authorities in an emergency condition. This group of utilities is called the Florida Reserve Sharing Group (FRSG) making the use of the contingency reserve through the network interconnections and reducing the risk of not serving native load requirement. The FRSG adjusts 102% for the most severe single contingency loss of capacity in Florida (i.e., 1114 MW, Sanford Unit Four) and adjusts to 1136 MW for contingency reserve in Florida in 2015. Contingency reserves may be comprised of different generating resources and interruptible load that are available within 15 minutes after the reportable disturbance. FRSG contingency reserves are maintained at this greater value to its most severe single contingency. As of August 2015, FMPP and Lakeland Electric's share of contingency share was 118 MW and 28 MW, respectively.

Lakeland Electric ensures capacity and energy sufficiency through Pool agreements and comply Reliability Standard (BAL-001-2) through the FRSG agreement with neighboring utilities to maintain system frequency limits in the Lakeland Electric system.

8.0 Environmental and Land Use Information

Lakeland's 2016 Ten-Year Site Plan has no capacity additions in it and thus no additional environmental or land use information is required at this time. All existing units are fully permitted and meet all permitted requirements. Any future additions would comply with all applicable environmental and land use requirements.

9.0 Ten-Year Site Plan Schedules

The following section presents the schedules required by the Ten-Year Site Plan rules for the Florida Public Service Commission. Lakeland has attempted to provide complete information for the FPSC whenever possible.

9.1 Abbreviations and Descriptions

The following abbreviations are used throughout the Ten-Year Site Plan Schedules.

Abbreviation	Description
Unit Type	
CA	Combined Cycle Steam Part
GT	Combustion Gas Turbine
ST	Steam Turbine
CT	Combined Cycle Combustion Turbine
IC	Internal Combustion Engine
Fuel Type	
NG	Natural Gas
DFO	Distillate Fuel Oil
RFO	Residual Fuel Oil
BIT	Bituminous Coal
WH	Waste Heat
Fuel Transportation Method	
PL	Pipeline
TK	Truck
RR	Railroad
Unit Status Code	
RE	Retired
SB	Cold Standby (Reserve)
TS	Construction Complete, not yet in commercial operation
U	Under Construction
P	Planned for installation

Table 9-1a
Schedule 1.0: Existing Generating Facilities as of December 31, 2015

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
				Fuel		Fuel Transport						Net Capability[1]	
Plant Name	Unit No.	Location	Unit Type	Pri	Alt	Pri	Alt	Alt Fuel Days Use	Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen. Max. Nameplate kW	Summer MW	Winter MW
Charles Larsen Memorial	2	16-17/28S/24E	GT	NG	DFO	PL	TK	28	11/62	Unknown	11,500	10	14
	3		GT	NG	DFO	PL	TK	28	12/62	Unknown	11,500	9	13
	8		CA	WH	---				04/56	Unknown	25,000	29	31
	8		CT	NG	DFO	PL	TK	5	07/92	Unknown	101,520	76	93
Plant Total												124	151

[1]Net Normal.

Source: Lakeland Energy Supply Unit Rating Group

Table 9-1a
Schedule 1.0: Existing Generating Facilities as of December 31, 2015

Plant Name	Unit No.	Location	Unit Type[3]	Fuel[4] Pri	Fuel[4] Alt	Fuel Transport[5] Pri	Fuel Transport[5] Alt	Alt Fuel Days Use[2]	Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen. Max. Nameplate kW	Net Capability Summer MW	Net Capability Winter MW
Winston Peaking Station	1-20	21/28S/23E	IC	NG	DFO	PL	TK	NR	12/01	Unknown	2,500 each	50	50
Plant Total												50	50
C.D. McIntosh, Jr.	D1	4-5/28S/24E	IC	DFO	---	TK	---	NR	01/70	Unknown	2,500	2.5	2.5
	D2		IC	DFO	---	TK	---	NR	01/70	Unknown	2,500	2.5	2.5
	GT1		GT	NG	DFO	PL	TK	NR	05/73	Unknown	26,640	16	19
	1		ST	NG	RFO	PL	TK	NR	02/71	12/15	103,000	85	85
	2		ST	NG	RFO	PL	TK	NR	06/76	Unknown	126,000	106	106
	3[1]		ST	BIT	---	RR	TK	NR	09/82	Unknown	363,870	205	205
	5		CT	NG	DFO	PL	TK	NR	05/01	Unknown	292,950	212	233
	5		CA	WH	---	---	---	NR	05/02	Unknown	135,000	126	121
Plant Total												755	774
System Total												**929**	**975**

[1]Lakeland's 60 percent portion of joint ownership with Orlando Utilities Commission.
[2]Lakeland does not maintain records of the number of days that alternate fuel is used.

[3]**Unit Type**		[4]**Fuel Type**		[5]**Fuel Transportation Method**	
CA	Combined Cycle Steam Part	DFO	Distillate Fuel Oil	PL	Pipeline
CT	Combined Cycle Combustion Turbine	RFO	Residual Fuel Oil	TK	Truck
GT	Combustion Gas Turbine	BIT	Bituminous Coal	RR	Railroad
ST	Steam Turbine	WH	Waste Heat		
		NG	Natural Gas		

Table 9-2

Schedule 2.1: History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rural & Residential					Commercial		
Year	Population	Members per Household	GWh	Average No. of Customers	Average kWh Consumption per Customer	GWh	Average No. of Customers	Average kWh Consumption per Customer
2006	253,405	2.57	1,438	98,680	14,572	756	11,832	63,895
2007	253,027	2.52	1,444	100,523	14,365	781	11,898	65,641
2008	252,731	2.51	1,383	100,739	13,729	762	11,913	63,964
2009	253,084	2.51	1,417	100,641	14,080	749	11,837	63,276
2010	253,009	2.51	1,530	100,719	15,191	753	11,806	63,781
2011	254,283	2.52	1,437	100,784	14,258	744	11,786	63,126
2012	262,288	2.59	1,343	101,251	13,264	727	11,764	61,799
2013	264,023	2.59	1,368	101,968	13,416	742	11,864	62,542
2014	271,379	2.63	1,400	103,099	13,579	752	12,023	62,547
2015	274,861	2.63	1,468	104,580	14,037	751	11,854	63,354
Forecast								
2016	278,684	2.62	1,443	106,289	13,576	734	11,889	61,738
2017	282,661	2.61	1,468	108,266	13,559	745	12,048	61,836
2018	286,833	2.60	1,493	110,202	13,548	755	12,204	61,865
2019	290,991	2.60	1,510	111,842	13,501	762	12,331	61,795
2020	295,160	2.60	1,512	113,347	13,340	766	12,428	61,635
2021	299,275	2.61	1,522	114,772	13,261	771	12,515	61,606
2022	303,356	2.61	1,537	116,225	13,224	778	12,611	61,692
2023	307,442	2.61	1,553	117,719	13,192	785	12,709	61,767
2024	311,544	2.61	1,570	119,195	13,172	791	12,807	61,763
2025	315,626	2.61	1,587	120,700	13,148	799	12,903	61,924

Table 9-3

Schedule 2.2: History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Industrial						
Year	GWh	Average No. of Customers	Average kWh Consumption per Customer	Railroads and Railways	Street & Highway Lighting GWh	Other Sales to Public Authorities GWh	Total Sales to Ultimate Consumers GWh
2006	586	87	6,735,632	0	21	87	2,888
2007	615	88	6,988,636	0	21	87	2,949
2008	607	87	6,977,011	0	21	85	2,859
2009	590	84	7,023,810	0	21	82	2,860
2010	581	84	6,916,667	0	21	81	2,966
2011	578	87	6,643,678	0	21	84	2,864
2012	579	81	7,148,148	0	21	82	2,751
2013	618	79	7,822,785	0	21	82	2,831
2014	649	78	8,320,513	0	21	82	2,903
2015	670	76	8,815,789	0	21	86	3,034
Forecast							
2016	665	72	9,236,111	0	21	86	2,992
2017	669	73	9,164,384	0	21	87	3,032
2018	691	77	8,974,026	0	21	87	3,091
2019	703	77	9,129,870	0	21	87	3,128
2020	706	77	9,168,831	0	21	87	3,137
2021	705	78	9,038,462	0	21	88	3,152
2022	705	78	9,038,462	0	21	88	3,175
2023	706	78	9,051,282	0	21	88	3,199
2024	709	78	9,089,744	0	21	88	3,226
2025	708	79	8,962,025	0	21	89	3,251

Table 9-4

Schedule 2.3: History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1)	(2)	(3)	(4)	(5)	(6)
Year	Wholesale Purchases for Resale GWH	Wholesale Sales for Resale GWH	Net Energy for Load GWh	Other Customers (Average No.)	Total No. of Customers
2006	0	0	3,000	10,017	120,616
2007	0	0	3,068	9,871	122,380
2008	0	0	2,975	9,685	122,425
2009	0	0	2,992	9,432	121,993
2010	0	0	3,118	9,209	121,818
2011	0	0	2,893	9,070	121,727
2012	0	0	2,873	8,954	122,051
2013	0	0	2,919	8,891	122,802
2014	0	0	3,006	8,821	124,020
2015	0	0	3,126	8,857	125,670
Forecast					
2016	0	0	3,099	8,884	127,501
2017	0	0	3,141	8,885	129,642
2018	0	0	3,201	8,897	131,756
2019	0	0	3,240	8,910	133,540
2020	0	0	3,248	8,923	135,158
2021	0	0	3,265	8,937	136,688
2022	0	0	3,289	8,950	138,252
2023	0	0	3,313	8,963	139,860
2024	0	0	3,341	8,975	141,449
2025	0	0	3,367	8,988	143,069

Table 9-5
Schedule 3.1: History and Forecast of Summer Peak Demand Base Case (MW)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Residential		Commercial/Industrial		
Year	Total	Wholesale	Retail	Interrupt.	Load Management	Conservation	Load Management	Conservation	Net Firm Demand
2006	631	0	631	0	0	0	0	0	631
2007	648	0	648	0	0	0	0	0	648
2008	615	0	615	0	0	0	0	0	615
2009	625	0	625	0	0	0	0	0	625
2010	638	0	638	0	0	0	0	0	638
2011	611	0	611	0	0	0	0	0	611
2012	590	0	590	0	0	0	0	0	590
2013	602	0	602	0	0	0	0	0	602
2014	627	0	627	0	0	0	0	0	627
2015	630	0	630	0	0	0	0	0	630
Forecast									
2016	640	0	640	0	0	0	0	0	640
2017	648	0	648	0	0	0	0	0	648
2018	662	0	662	0	0	0	0	0	662
2019	669	0	669	0	0	0	0	0	669
2020	673	0	673	0	0	0	0	0	673
2021	677	0	677	0	0	0	0	0	677
2022	683	0	683	0	0	0	0	0	683
2023	689	0	689	0	0	0	0	0	689
2024	695	0	695	0	0	0	0	0	695
2025	701	0	701	0	0	0	0	0	701

Table 9-5a
Schedule 3.1a: History and Forecast of Summer Peak Demand Low Case (MW)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Residential		Commercial/Industrial		
Year	Total	Wholesale	Retail	Interrupt.	Load Management	Conservation	Load Management	Conservation	Net Firm Demand
2006	631	0	631	0	0	0	0	0	631
2007	648	0	648	0	0	0	0	0	648
2008	615	0	615	0	0	0	0	0	615
2009	625	0	625	0	0	0	0	0	625
2010	638	0	638	0	0	0	0	0	638
2011	611	0	611	0	0	0	0	0	611
2012	590	0	590	0	0	0	0	0	590
2013	602	0	602	0	0	0	0	0	602
2014	627	0	627	0	0	0	0	0	627
2015	630	0	630	0	0	0	0	0	630
Forecast									
2016	635	0	635	0	0	0	0	0	635
2017	644	0	644	0	0	0	0	0	644
2018	657	0	657	0	0	0	0	0	657
2019	664	0	664	0	0	0	0	0	664
2020	668	0	668	0	0	0	0	0	668
2021	672	0	672	0	0	0	0	0	672
2022	678	0	678	0	0	0	0	0	678
2023	683	0	683	0	0	0	0	0	683
2024	690	0	690	0	0	0	0	0	690
2025	696	0	696	0	0	0	0	0	696

Table 9-5b
Schedule 3.1b: History and Forecast of Summer Peak Demand High Case (MW)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Residential		Commercial/Industrial		
Year	Total	Wholesale	Retail	Interrupt.	Load Management	Conservation	Load Management	Conservation	Net Firm Demand
2006	631	0	631	0	0	0	0	0	631
2007	648	0	648	0	0	0	0	0	648
2008	615	0	615	0	0	0	0	0	615
2009	625	0	625	0	0	0	0	0	625
2010	638	0	638	0	0	0	0	0	638
2011	611	0	611	0	0	0	0	0	611
2012	590	0	590	0	0	0	0	0	590
2013	602	0	602	0	0	0	0	0	602
2014	627	0	627	0	0	0	0	0	627
2015	630	0	630	0	0	0	0	0	630
Forecast									
2016	644	0	644	0	0	0	0	0	644
2017	653	0	653	0	0	0	0	0	653
2018	666	0	666	0	0	0	0	0	666
2019	674	0	674	0	0	0	0	0	674
2020	678	0	678	0	0	0	0	0	678
2021	682	0	682	0	0	0	0	0	682
2022	688	0	688	0	0	0	0	0	688
2023	694	0	694	0	0	0	0	0	694
2024	700	0	700	0	0	0	0	0	700
2025	707	0	707	0	0	0	0	0	707

Table 9-6
Schedule 3.2: History and Forecast of Winter Peak Demand Base Case (MW)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Year	Total	Wholesale	Retail	Interrupt.	Residential		Comm./Ind.		Net Firm Demand
					Load Management	Conservation	Load Management	Conservation	
2006/07	596	0	596	0	0	0	0	0	596
2007/08	684	0	684	0	0	0	0	0	684
2008/09	710	0	710	0	0	0	0	0	710
2009/10	804	0	804	0	0	0	0	0	804
2009/10	709	0	709	0	0	0	0	0	709
2011/12	612	0	612	0	0	0	0	0	612
2012/13	553	0	553	0	0	0	0	0	553
2013/14	579	0	579	0	0	0	0	0	579
2014/15	656	0	656	0	0	0	0	0	656
2015/16	589	0	589	0	0	0	0	0	589
Forecast									
2016/17	679	0	679	0	0	0	0	0	679
2017/18	690	0	690	0	0	0	0	0	690
2018/19	700	0	700	0	0	0	0	0	700
2019/20	702	0	702	0	0	0	0	0	702
2020/21	702	0	702	0	0	0	0	0	702
2021/22	707	0	707	0	0	0	0	0	707
2022/23	711	0	711	0	0	0	0	0	711
2023/24	718	0	718	0	0	0	0	0	718
2024/25	721	0	721	0	0	0	0	0	721
2025/26	726	0	726	0	0	0	0	0	726

Table 9-6a
Schedule 3.2a: History and Forecast of Winter Peak Demand Low Case (MW)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Year	Total	Wholesale	Retail	Interrupt.	Residential		Comm./Ind.		Net Firm Demand
					Load Management	Conservation	Load Management	Conservation	
2006/07	596	0	596	0	0	0	0	0	596
2007/08	684	0	684	0	0	0	0	0	684
2008/09	710	0	710	0	0	0	0	0	710
2009/10	804	0	804	0	0	0	0	0	804
2009/10	665	0	665	0	0	0	0	0	665
2011/12	612	0	612	0	0	0	0	0	612
2012/13	553	0	553	0	0	0	0	0	553
2013/14	579	0	579	0	0	0	0	0	579
2014/15	656	0	656	0	0	0	0	0	656
2015/16	589	0	589	0	0	0	0	0	589
Forecast									
2016/17	674	0	674	0	0	0	0	0	674
2017/18	685	0	685	0	0	0	0	0	685
2018/19	694	0	694	0	0	0	0	0	694
2019/20	696	0	696	0	0	0	0	0	696
2020/21	697	0	697	0	0	0	0	0	697
2021/22	701	0	701	0	0	0	0	0	701
2022/23	705	0	705	0	0	0	0	0	705
2023/24	712	0	712	0	0	0	0	0	712
2024/25	715	0	715	0	0	0	0	0	715
2025/26	719	0	719	0	0	0	0	0	719

Table 9-6b
Schedule 3.2b: History and Forecast of Winter Peak Demand High Case (MW)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			Retail	Interrupt.	Residential		Comm./Ind.		
Year	Total	Wholesale			Load Management	Conservation	Load Management	Conservation	Net Firm Demand
2006/07	596	0	596	0	0	0	0	0	596
2007/08	684	0	684	0	0	0	0	0	684
2008/09	710	0	710	0	0	0	0	0	710
2009/10	804	0	804	0	0	0	0	0	804
2009/10	665	0	665	0	0	0	0	0	665
2011/12	612	0	612	0	0	0	0	0	612
2012/13	553	0	553	0	0	0	0	0	553
2013/14	579	0	579	0	0	0	0	0	579
2014/15	656	0	656	0	0	0	0	0	656
2015/16	589	0	589	0	0	0	0	0	589
Forecast									
2016/17	685	0	685	0	0	0	0	0	685
2017/18	696	0	696	0	0	0	0	0	696
2018/19	705	0	705	0	0	0	0	0	705
2019/20	708	0	708	0	0	0	0	0	708
2020/21	708	0	708	0	0	0	0	0	708
2021/22	712	0	712	0	0	0	0	0	712
2022/23	717	0	717	0	0	0	0	0	717
2023/24	724	0	724	0	0	0	0	0	724
2024/25	727	0	727	0	0	0	0	0	727
2025/26	732	0	732	0	0	0	0	0	732

Table 9-7
Schedule 3.3: History and Forecast of Annual Net Energy for Load – GWh
Base Case

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year	Total	Residential Conservation	Comm./Ind. Conservation	Retail	Wholesale	Utility Use & Losses	Net Energy for Load	Load Factor %
2006	2,888	0	0	2,888	0	112	3,000	50.36%
2007	2,949	0	0	2,949	0	120	3,068	54.05%
2008	2,859	0	0	2,859	0	117	2,975	49.65%
2009	2,860	0	0	2,860	0	133	2,992	48.11%
2010	2,966	0	0	2,966	0	152	3,118	44.27%
2011	2,864	0	0	2,864	0	29	2,893	46.58%
2012	2,751	0	0	2,751	0	121	2,873	53.59%
2013	2,831	0	0	2,831	0	88	2,919	55.35%
2014	2,903	0	0	2,903	0	102	3,006	54.73%
2015	3,034	0	0	3,034	0	92	3,126	54.40%
Forecast								
2016	2,992	0	0	2,992	0	106	3,099	52.64%
2017	3,032	0	0	3,032	0	108	3,141	52.81%
2018	3,091	0	0	3,091	0	110	3,201	52.96%
2019	3,128	0	0	3,128	0	112	3,240	52.84%
2020	3,137	0	0	3,137	0	111	3,248	52.82%
2021	3,152	0	0	3,152	0	112	3,265	53.09%
2022	3,175	0	0	3,175	0	114	3,289	53.11%
2023	3,199	0	0	3,199	0	114	3,313	53.19%
2024	3,226	0	0	3,226	0	115	3,341	53.12%
2025	3,251	0	0	3,251	0	116	3,367	53.31%

Table 9-7a
Schedule 3.3a: History and Forecast of Annual Net Energy for Load – GWh
Low Case

(1) Year	(2) Total	(3) Residential Conservation	(4) Comm./Ind. Conservation	(5) Retail	(6) Wholesale	(7) Utility Use & Losses	(8) Net Energy for Load
2006	2,888	0	0	2,888	0	112	3,000
2007	2,949	0	0	2,949	0	119	3,068
2008	2,859	0	0	2,859	0	116	2,975
2009	2,860	0	0	2,860	0	132	2,992
2010	2,966	0	0	2,966	0	152	3,118
2011	2,864	0	0	2,864	0	29	2,893
2012	2,751	0	0	2,751	0	122	2,873
2013	2,831	0	0	2,831	0	88	2,919
2014	2,903	0	0	2,903	0	103	3,006
2015	3,034	0	0	3,034	0	92	3,126
Forecast							
2016	2,974	0	0	2,974	0	106	3,080
2017	3,014	0	0	3,014	0	107	3,121
2018	3,072	0	0	3,072	0	109	3,181
2019	3,108	0	0	3,108	0	111	3,219
2020	3,117	0	0	3,117	0	111	3,228
2021	3,132	0	0	3,132	0	112	3,244
2022	3,155	0	0	3,155	0	113	3,268
2023	3,178	0	0	3,178	0	114	3,292
2024	3,205	0	0	3,205	0	114	3,319
2025	3,229	0	0	3,229	0	116	3,345

Table 9-7b
Schedule 3.3b: History and Forecast of Annual Net Energy for Load – GWh
High Case

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year	Total	Residential Conservation	Comm./Ind. Conservation	Retail	Wholesale	Utility Use & Losses	Net Energy for Load
2006	2,888	0	0	2,888	0	112	3,000
2007	2,949	0	0	2,949	0	119	3,068
2008	2,859	0	0	2,859	0	116	2,975
2009	2,860	0	0	2,860	0	132	2,992
2010	2,966	0	0	2,966	0	152	3,118
2011	2,864	0	0	2,864	0	29	2,893
2012	2,751	0	0	2,751	0	122	2,873
2013	2,831	0	0	2,831	0	88	2,919
2014	2,903	0	0	2,903	0	103	3,006
2015	3,034	0	0	3,034	0	92	3,126
Forecast							
2016	3,011	0	0	3,011	0	98	3,109
2017	3,052	0	0	3,052	0	109	3,161
2018	3,111	0	0	3,111	0	111	3,222
2019	3,148	0	0	3,148	0	112	3,260
2020	3,157	0	0	3,157	0	112	3,269
2021	3,173	0	0	3,173	0	113	3,286
2022	3,196	0	0	3,196	0	114	3,310
2023	3,220	0	0	3,220	0	115	3,335
2024	3,247	0	0	3,247	0	116	3,363
2025	3,272	0	0	3,272	0	117	3,389

Table 9-8

Schedule 4: Previous Year and Two Year Forecast of Retail Peak Demand and Net Energy for Load by Month

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Month	Actual		2016 Forecast		2017 Forecast	
	Peak Demand[1] MW	NEL GWh	Peak Demand[1] MW	NEL GWh	Peak Demand[1] MW	NEL GWh
January	493	228	672	243	679	247
February	656	213	565	202	567	199
March	492	239	482	235	486	238
April	524	257	535	247	541	250
May	587	285	586	297	593	301
June	630	293	616	292	624	295
July	607	296	640	301	648	306
August	629	303	624	314	631	319
September	612	287	602	270	610	274
October	566	254	573	249	582	254
November	527	237	449	211	458	215
December	468	234	503	238	511	243

[1]Includes Conservation

Table 9-9
Schedule 5: Fuel Requirements

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
				Calendar Year										
	Fuel Requirements	Type	UNITS	2015-Actual	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
(1)	Nuclear		Trillion Btu	0	0	0	0	0	0	0	0	0	0	0
(2)	Coal		1000 Ton	378	277	371	284	274	272	261	269	325	334	284
(3)	Residual	Steam	1000 BBL	0	0	0	0	0	0	0	0	0	0	0
(4)		CC	1000 BBL	0	0	0	0	0	0	0	0	0	0	0
(5)		CT	1000 BBL	0	0	0	0	0	0	0	0	0	0	0
(6)		Total	1000 BBL	0	0	0	0	0	0	0	0	0	0	0
(7)	Distillate	Steam	1000 BBL	0	0	0	0	0	0	0	0	0	0	0
(8)		CC	1000 BBL	0	0	0	0	0	0	0	0	0	0	0
(9)		CT	1000 BBL	2	0	0	0	0	0	0	0	0	0	0
(10)		Total	1000 BBL	2	0	0	0	0	0	0	0	0	0	0
(11)	Natural Gas	Steam	1000 MCF	668	297	267	181	211	255	242	347	223	240	316
(12)		CC	1000 MCF	15,774	19,467	15,836	17,845	17,654	17,773	16,770	18,090	18,913	16,838	18,969
(13)		CT	1000 MCF	3	0	3	3	3	1	0	0	0	0	2
(14)		Total	1000 MCF	16,445	19,764	16,106	18,029	17,868	18,029	17,012	18,437	19,136	17,078	19,287
(15)	Other		Trillion Btu	0	0	0	0	0	0	0	0	0	0	0

Table 9-10
Schedule 6.1: Energy Sources

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
				Calendar Year										
	Energy Sources	Type	UNITS	2015-Actual	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
(1)	Inter-Regional Interchange		GWh	0	0	0	0	0	0	0	0	0	0	0
(2)	Nuclear		GWh	0	0	0	0	0	0	0	0	0	0	0
(3)	Coal		GWh	788	583	812	604	587	589	565	586	710	731	624
(4)	Residual	Steam	GWh	0	0	0	0	0	0	0	0	0	0	0
(5)		CC	GWh	0	0	0	0	0	0	0	0	0	0	0
(6)		CT	GWh	0	0	0	0	0	0	0	0	0	0	0
(7)		Total	GWh	0	0	0	0	0	0	0	0	0	0	0
(8)	Distillate	Steam	GWh	0	0	0	0	0	0	0	0	0	0	0
(9)		CC	GWh	0	0	0	0	0	0	0	0	0	0	0
(10)		CT	GWh	0	0	0	0	0	0	0	0	0	0	0
(11)		Total	GWh	0	0	0	0	0	0	0	0	0	0	0
(12)	Natural Gas	Steam	GWh	27	24	21	15	17	20	20	28	18	19	26
(13)		CC	GWh	2,177	2,854	2,326	2,629	2,603	2,620	2,472	2,663	2,782	2,468	2,786
(14)		CT	GWh	0	0	0	0	0	0	0	0	0	0	0
(15)		Total	GWh	2,204	2,878	2,347	2,644	2,620	2,640	2,492	2,691	2,800	2,487	2,812
(16)	NUG			0	0	0	0	0	0	0	0	0	0	0
(17)	Solar			16	29	32	41	40	40	40	39	39	39	38
(18)	Other (Specify)[1]			118	-391	-50	-88	-7	-21	168	-27	-236	84	-107
(19)	Net Energy for Load		GWh	3,126	3,099	3,141	3,201	3,240	3,248	3,265	3,289	3,313	3,341	3,367

[1] Intra-Regional Net Interchange

Table 9-11
Schedule 6.2: Energy Sources

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
				Calendar Year										
	Energy Source	Type	Units	2015-Actual	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
(1)	Inter-Regional Interchange		%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(2)	Nuclear		%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(3)	Coal		%	25.21	18.81	25.85	18.87	18.12	18.13	17.30	17.82	21.43	21.88	18.53
(4)	Residual	Steam	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(5)		CC	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(6)		CT	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(7)		Total	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(8)	Distillate	Steam	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(9)		CC	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(10)		CT	%	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(11)		Total	%	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(12)	Natural Gas	Steam	%	0.86	0.77	0.67	0.47	0.52	0.62	0.61	0.85	0.54	0.57	0.77
(13)		CC	%	69.64	92.09	74.05	82.13	80.34	80.67	75.71	80.97	83.97	73.87	82.74
(14)		CT	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(15)		Total	%	70.51	92.87	74.72	82.60	80.86	81.28	76.32	81.82	84.52	74.44	83.52
(16)	NUG		%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Solar		%	0.51	0.94	1.02	1.28	1.23	1.23	1.23	1.19	1.18	1.17	1.13
	Other (Specify)[1]		%	3.77	-12.62	-1.59	-2.75	-0.22	-0.65	5.15	-0.82	-7.12	2.51	-3.18
(18)	Net Energy for Load		%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1] Other = Intra-Regional Net Interchange

Table 9-12

Schedule 7.1: Forecast of Capacity, Demand, and Scheduled Maintenance at Time of Summer Peak

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Total Installed Capacity	Firm Capacity Import	Firm Capacity Export	Projected Firm Net To Grid from NUG	Total Capacity Available	System Firm Peak Demand	Reserve Margin Before Maintenance[1]		Scheduled Maintenance	Reserve Margin After Maintenance[1]	
	MW	MW	MW	MW	MW	MW	MW	%	MW	MW	%
2016	844	0	0	0	844	640	204	32	0	204	32
2017	844	0	0	0	844	648	196	30	0	196	30
2018	844	0	0	0	844	662	182	27	0	182	27
2019	844	0	0	0	844	669	175	26	0	175	26
2020	844	0	0	0	844	673	171	25	0	171	25
2021	844	0	0	0	844	677	167	25	0	167	25
2022	844	0	0	0	844	683	161	24	0	161	24
2023	844	0	0	0	844	689	155	22	0	155	22
2024	844	0	0	0	844	695	149	21	0	149	21
2025	844	0	0	0	844	701	143	20	0	143	20

[1]Includes Conservation

Table 9-13

Schedule 7.2: Forecast of Capacity, Demand, and Scheduled Maintenance at Time of Winter Peak

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Total Installed Capacity	Firm Capacity Import	Firm Capacity Export	Projected Firm Net To Grid from NUG	Total Capacity Available	System Firm Peak Demand	Reserve Margin Before Maintenance[1]		Scheduled Maintenance	Reserve Margin After Maintenance[1]	
	MW	MW	MW	MW	MW	MW	MW	%	MW	MW	%
2016/17	890	0	0	0	890	679	211	31	0	211	31
2017/18	890	0	0	0	890	690	200	29	0	200	29
2018/19	890	0	0	0	890	700	190	27	0	190	27
2019/20	890	0	0	0	890	702	188	27	0	188	27
2020/21	890	0	0	0	890	702	188	27	0	188	27
2021/22	890	0	0	0	890	707	183	26	0	183	26
2022/23	890	0	0	0	890	711	179	25	0	179	25
2023/24	890	0	0	0	890	718	172	24	0	172	24
2024/25	890	0	0	0	890	721	169	23	0	169	23
2025/26	890	0	0	0	890	726	164	23	0	164	23

[1]Includes Conservation

Table 9-14
Schedule 8.0: Planned and Prospective Generating Facility Additions and Changes

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Plant Name	Unit No.	Location	Unit Type	Fuel		Fuel Transport		Const Start	Commercial In-Service	Expected Retirement	Gen Max Nameplate	Net Capability		Status
				Pri.	Alt.	Pri.	Alt.	Mo/Yr	Mo/Yr	Mo/Yr	kW	Sum MW	Win MW	

None At Time of This Filing

Table 9-15
Schedule 9.1: Status Report and Specifications of Approved Generating Facilities

(1)	Plant Name and Unit Number:	N/A
(2)	Capacity:	
(3)	Summer MW	
(4)	Winter MW	
(5)	Technology Type:	
(6)	Anticipated Construction Timing:	
(7)	Field Construction Start-date:	
(8)	Commercial In-Service date:	
(9)	Fuel	
(10)	Primary	
(11)	Alternate	
(12)	Air Pollution Control Strategy:	
(13)	Cooling Method:	
(14)	Total Site Area:	
(15)	Construction Status:	
(16)	Certification Status:	
(17)	Status with Federal Agencies:	
(18)	Projected Unit Performance Data:	
(19)	Planned Outage Factor (POF):	
(20)	Forced Outage Factor (FOF):	
(21)	Equivalent Availability Factor (EAF):	
(22)	Resulting Capacity Factor (%):	
(23)	Average Net Operating Heat Rate (ANOHR):	
(24)	Projected Unit Financial Data:	
(25)	Book Life:	
(26)	Total Installed Cost (In-Service year $/kW):	
(27)	Direct Construction Cost ($/kW):	
(28)	AFUDC Amount ($/kW):	
(29)	Escalation ($/kW):	
(30)	Fixed O&M ($/kW-yr):	
(31)	Variable O&M ($/MWh):	

Table 9-16
Schedule 9.2: Status Report and Specifications of Proposed Generating Facilities

(1)	Plant Name and Unit Number:	None in Current Planning Cycle
(2)	Capacity:	
(3)	Summer MW	
(4)	Winter MW	
(5)	Technology Type:	
(6)	Anticipated Construction Timing:	
(7)	Field Construction Start-date:	
(8)	Commercial In-Service date:	
(9)	Fuel	
(10)	Primary	
(11)	Alternate	
(12)	Air Pollution Control Strategy:	
(13)	Cooling Method:	
(14)	Total Site Area:	
(15)	Construction Status:	
(16)	Certification Status:	
(17)	Status with Federal Agencies:	
(18)	Projected Unit Performance Data:	
(19)	Planned Outage Factor (POF):	
(20)	Forced Outage Factor (FOF):	
(21)	Equivalent Availability Factor (EAF):	
(22)	Resulting Capacity Factor (%):	
(23)	Average Net Operating Heat Rate (ANOHR):	
(24)	Projected Unit Financial Data:	
(25)	Book Life:	
(26)	Total Installed Cost (In-Service year $/kW):	
(27)	Direct Construction Cost ($/kW):	
(28)	AFUDC Amount ($/kW):	
(29)	Escalation ($/kW):	
(30)	Fixed O&M ($/kW-yr):	
(31)	Variable O&M ($/MWh):	

Table 9-17
Schedule 10: Status Report and Specifications of Proposed Directly Associated Transmission Lines

(1)	Point of Origin and Termination:	None planned.
(2)	Number of Lines:	None planned.
(3)	Right of Way:	None planned.
(4)	Line Length:	None planned.
(5)	Voltage:	None planned.
(6)	Anticipated Construction Time:	None planned.
(7)	Anticipated Capital Investment:	None planned.
(8)	Substations:	None planned.
(9)	Participation with Other Utilities:	None planned.