LAKELAND ELECTRIC

Your Essential Link to a Quality Life

Director, Office of Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850
Attn: Carlotta Stauffer

March 29, 2017

Dear Ms. Stauffer,

Pursuant to Section 186.801, Florida Statutes and Rules 25-22.070-072 of Florida Administrative Code, Lakeland Electric hereby submits 5 printed copies of its 2017 Ten Year Site Plan.

If you have any questions please do not hesitate to contact us.

Sincerely,

Jade Gu

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Lakeland Electric
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LAKELAND ELECTRIC

2017 Ten-Year Site Plan

Electrical Generating Facilities & Associated Transmission Lines

April 2017

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1.0 Introduction

This report contains the 2017 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, 2016. 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 the existing power generating and transmission facilities. This section includes tables which show the source of the utility's current 890 MW of net winter generating capacity and 844 MW of net summer generating capacity (as of the end of calendar year 2016).

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 is continuing the following Energy Efficiency & Conservation Programs during 2017:

- 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. 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 114,000 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 summer 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 six (6) units in commercial operation having a total net winter and summer capacity of 689 MW and 670 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. 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, 2016.

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, 2016.

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 2016/2017 was 539 MW which occurred on January 9, 2017. The actual summer peak in 2016 was 647 MW and occurred on July 27, 2016. 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

Plant Name	Unit	Particulate	Flue Gas Cleaning SO_x	Flue Gas Cleaning NO_x	Type
Charles Larsen Memorial	8ST	N/A	N/A	N/A	OTF
C. D. McIntosh, Jr.	2 3 5ST	None EP N/A	LS S N/A	FGR LNB N/A	WCTM WCTM 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	16	11/62	Unknown	11,250	10	14
	3		GT	NG	DFO	PL	TK	16	12/62	Unknown	11,250	9	13
	8		CA	WH	---	---	---	---	04/56	Unknown	26,000	29	31
	8		CT	NG	DFO	PL	TK	3	07/92	Unknown	88,000	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		[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		

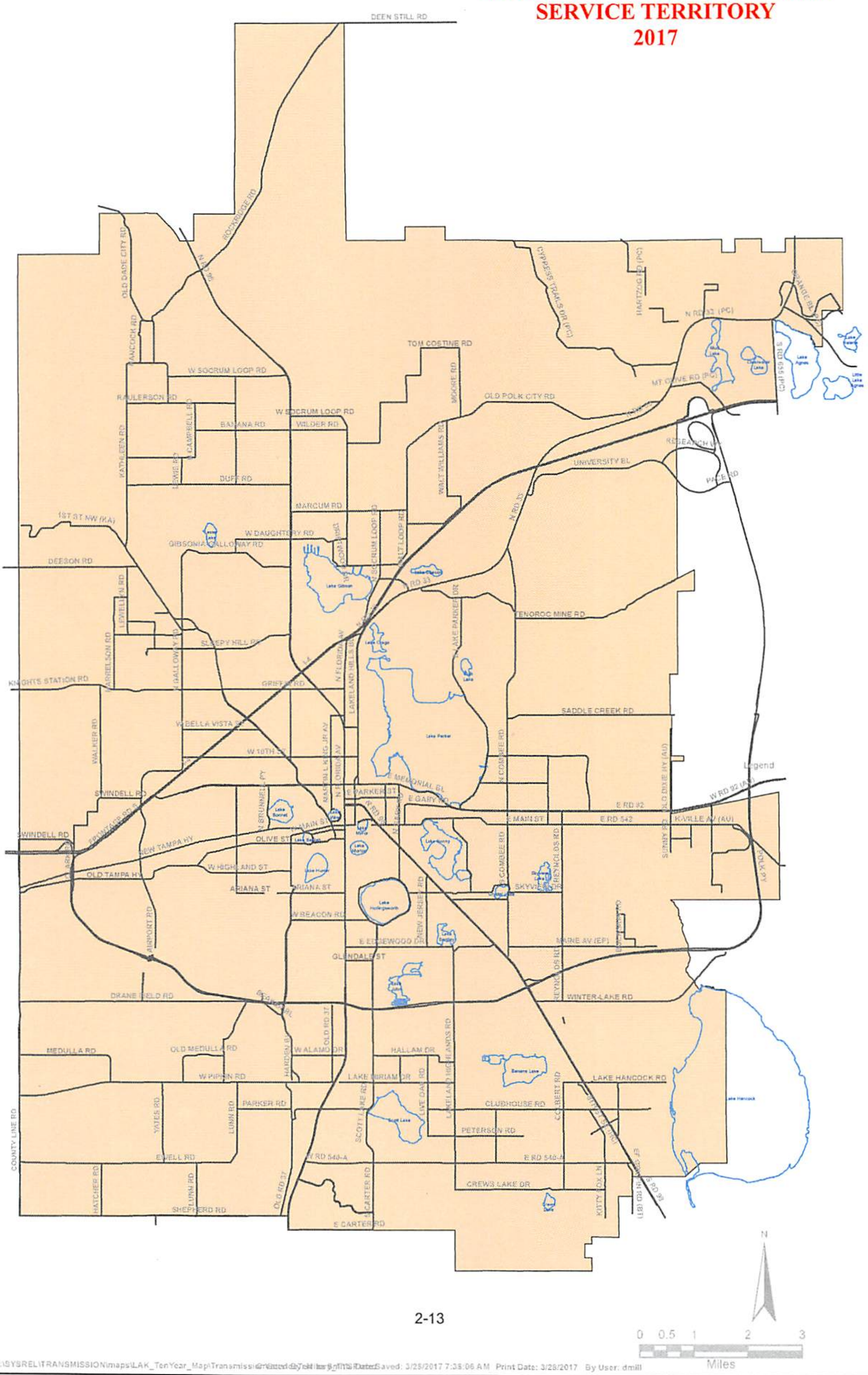
Table 2-2b
Lakeland Electric Existing Generating Facilities

				Fuel[4]		Fuel Transport[5]						Net Capability	
Plant Name	Unit No.	Location	Unit Type[3]	Pri	Alt	Pri	Alt	Alt Fuel Days Use[2]	Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen. Max. Nameplate kW	Summer MW	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	20,000	16	19
	2		ST	NG	RFO	PL	TK	14	06/76	Unknown	114,700	106	106
	3[1]		ST	BIT	---	RR	TK	NR	09/82	Unknown	219,000	205	205
	5		CT	NG	---	PL	---	NR	05/01	Unknown	245,000	213	233
	5		CA	WH	---	---	---	NR	05/02	Unknown	120,000	125	121
Plant Total												670	689
System Total												**844**	**890**

[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		

LAKELAND ELECTRIC SYSTEM SERVICE TERRITORY 2017



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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, to develop the long-term system hourly load forecast.

Many variables are 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), total employment, disposable personal income per household, persons per household, growth in number of households, growth in population, price, structural changes (appliance saturation and efficiency trends), and weather. Binary variables are also used to explain outliers in historical billing discrepancies, trend shifts, monthly seasonality, rate migration between classes, etc.

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

The real price of electricity is developed using a 12-month moving average of real average price. The historical price data, along with the Consumer Price Index (CPI), is used to develop a price forecast for the MetrixND modeling structure. The end-use saturation and efficiency indices used in the models are purchased from Itron. Itron's Energy Forecasting Group (EFG) offers end-use data services and forecasting support. EFG's projections are based on data derived from the Energy Information Administration's South Atlantic Census Division. Itron is also 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 (HDD) or Cooling Degree Day (CDD).

These HDD and CDD variables are used in the forecasting process to correlate electric consumption with weather. The HDD and CDD variables 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. The forecast models are developed using historical 20-year normal weather.

Normal temperatures at time of peak are used for peak modeling. HDDs and CDDs are calculated for each historical monthly peak and the weather variables are ranked from the highest to lowest value within each year. Normal peak day HDDs and CDDs are then defined as an average across the rankings. Finally, the average values are mapped back to the month during which the highest HDD or CDD typically occurs.

Historical monthly data is available and is analyzed for the 20-year period. Careful evaluation of the data and model statistics is performed, which results in most models being developed using less than a 10-year estimation period.

The modeling techniques used to generate the forecast include: 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) econometric 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 27° F to 44° 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 92° F to 99° 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 3.2% (based on historical monthly data) is applied to convert total energy sales to 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 2016 is 279,331 persons.

Population Forecast

LE's service territory population is projected to increase at an estimated 1.39% average annual growth rate (AAGR) for years 2017 – 2026.

Polk County's population (Lakeland/Winter-Haven MSA) is forecasted to grow at 1.79% 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

A regression model was used to develop the Residential account forecast using monthly customer data. Total Residential accounts were projected as a function of population 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

Commercial accounts consist of the General Service (GS), General Service Business Demand (GSBD) and General Service Demand revenue classes.

Due in large part to energy efficiency, LE is experiencing a long term trend of General Service Large Demand (GSLD) customers migrating to the Commercial rate classes. For this reason, a regression model combining both Commercial and GSLD rate classes is being used. The number of Commercial and GSLD accounts is projected as a function of total employment in the Lakeland/Winter Haven Metropolitan Statistical Area (MSA).

A ratio of the Commercial and GSLD rate classes is then applied to generate the Commercial and GSLD account forecasts.

3.2.3 Industrial Accounts

Industrial accounts consist of General Service Large Demand (GSLD), Interruptible (INT) and Extra Large Demand Customer (ELDC) revenue classes.

The GSLD rate class is defined by customers reaching a billing demand of 500KW at least three times in the past rolling 12 months. As noted in section 3.2.2, the GSLD account forecast is a ratio of the combined Commercial and GSLD account forecast.

The INT rate class is defined as customers reaching a billing demand of 1000 KW or greater at least three times in the past rolling 12 months.

The ELDC rate class is defined by customers reaching a billing demand above 5000 KW at least three times in the past rolling 12 months.

Projections for the INT and ELDC accounts are modeled independently of MetrixND. Special consideration is 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 consists of those accounts within the Municipal, Electric, and Water Departments of the City of Lakeland as well as private area lighting and roadway lighting.

Historical data for these classes is inconsistent and difficult to model. Therefore, the account projections for this category are based on time trends and historical growth rates. LE also takes into consideration any future projects and potential developments. These forecasts are developed outside of MetrixND.

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 following forecasts:

- Residential
- Commercial
- Industrial
- Other

3.3.1 Residential Energy Sales Forecast

The Residential energy sales forecast is 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 are also used to explain outliers in the historical billing data.

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

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

Where:

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

$$XCool_{y,m} = CoolIndex_y \times CoolUse_{y,m}$$

$XCool_{y,m}$	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:

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

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

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

Where:

$XHeat_{y,m}$ 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:

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

$HeatUse_{y,m}$ 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:

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

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

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

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

As mentioned in section 3.2.2, there is increasing rate migration between the GSLD and Commercial rate classes due to energy efficiency. Further, the majority of GSLD customers in the LE service area are in buildings that are classified as Commercial as defined by the U.S. Energy Information Administration. Therefore, a combined Commercial and GSLD energy sales model is generated. This model is also developed using the SAE modeling approach.

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 are also used to help explain fluctuations in historical billing data due to rate migrations, billing discrepancies, seasonality, etc.

3.3.3 Industrial Energy Sales

While the GSLD demand and energy sales are forecast in combination with Commercial energy sales, the remainder of the Industrial class – the INT and ELDC rate classes - are modeled independently of MetrixND and later imported into the model to generate the Total Sales Forecast. Each INT and ELDC 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 is also integrated into the forecasting process.

3.3.4 Other Sales Forecast

Other energy sales consist of sales for the City's Municipal, Electric and Water Departments, private area lighting, roadway lighting, and unmetered (street lighting) rate classes. Models are 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 potential 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 is applied to the total sales forecast to convert sales to NEL. Electric losses, the measure of the amount of energy lost during the generation, transmission, and distribution of electricity are developed using a historical average.

3.5 Peak Demand Forecast

A regression model is estimated in MetrixND to 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 are 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 is 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 are reviewed by an outside consultant. Itron is contracted to review all sales, customer, peak and energy forecast models for reasonableness and statistical significance. Itron also evaluates and reviews all key forecast assumptions.

Additionally, the MetrixND software is 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 2017

In keeping with Lakeland Electric's plan to promote retail conservation programs, the utility is continuing the following Energy Efficiency & Conservation Programs during 2017:

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, LED, 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

- 2.6 mw demand reduction and over 4,600,000 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 2016 there were 261 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 2016 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.

As of January 2017, there were a total of 181 PV systems that had been privately owned in the Lakeland Electric service territory. These systems now generate a total of 880 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.

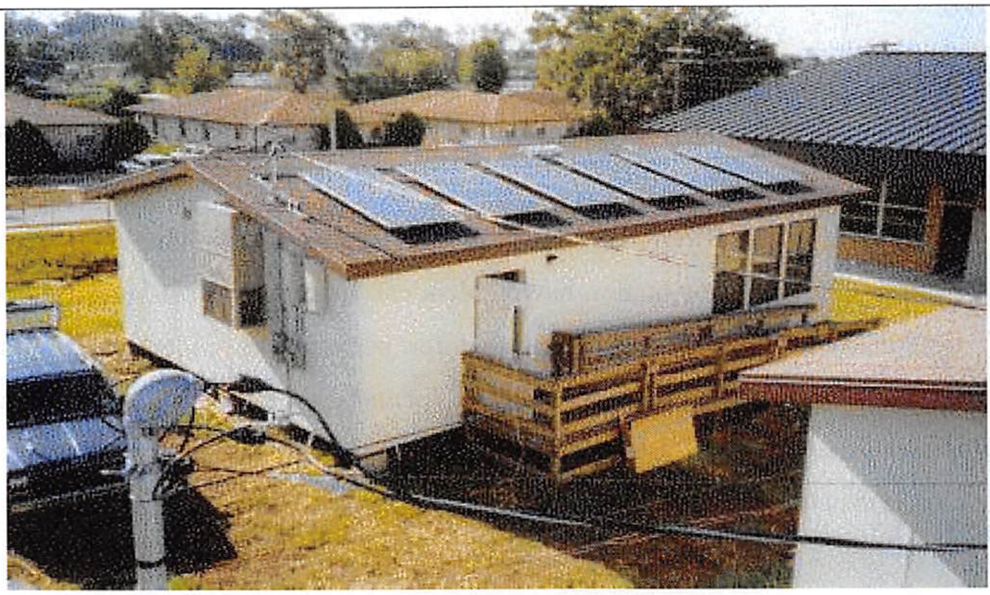

Figure 4-2
Portable Classroom Topped by PV Panels

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.

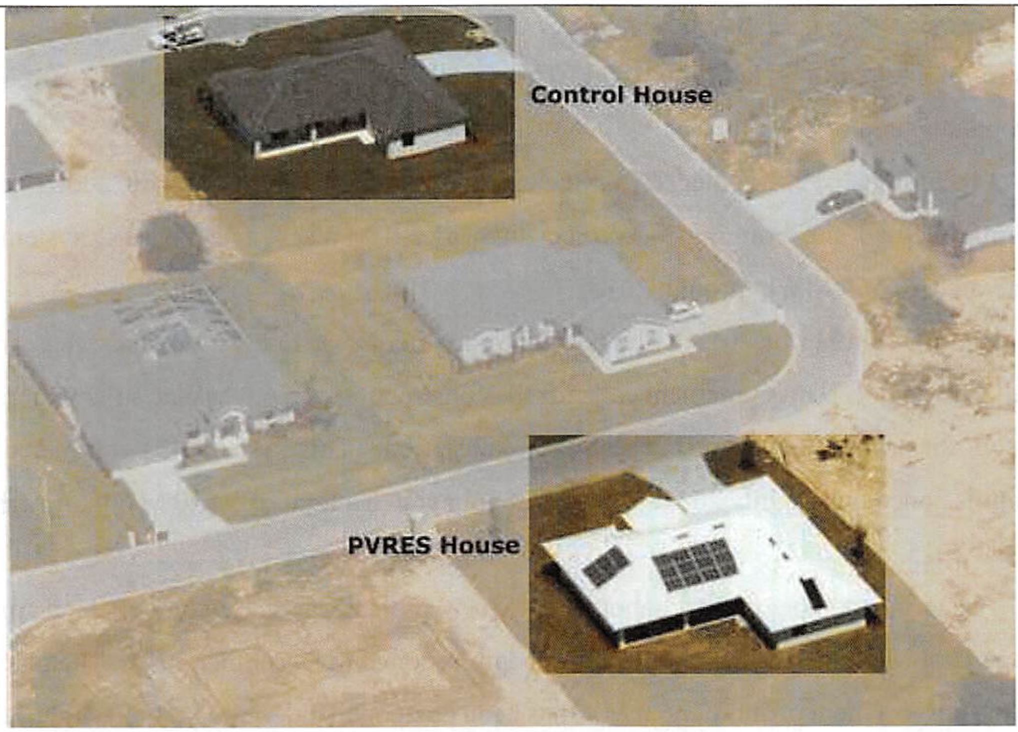

Figure 4-3
Solar House and Control House

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 2.25 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 2.75 megawatt PV system (Phase 2) was added to the Hamilton Road site bringing the project total to 5.0 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 was commissioned in December 2016. The plan call for the development of another 6.0 MW has been postponed indefinitely. Lakeland Electric has a total of ~14.4 MW of solar capacity which has the potential to 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 2016.

4.2.10 Energy Storage Solution Pilot

The City of Lakeland is constantly looking to provide its customer base with the highest value by offering creative solutions to improve reliability and efficiency. The COL is planning to deploy a pilot battery energy storage solution in 2017. The energy storage solution is intended to provide energy storage capability to shave customer's peak demand which can potentially lead to monetary savings.

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 a 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 2017. 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 2.4% base off the 2017 U.S. Energy Information Administration (EIA) forecast. Transportation inflation rate is base off the January 2017-2027 Congressional Budget Office (CBO) GDP inflation rate of 2%. Natural Gas forecast uses a blended average from a consultant forecast and the 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 2017 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]
2017	$3.32	$3.96	$9.57	$14.33
2018	$3.40	$3.87	$9.82	$16.22
2019	$3.48	$3.61	$9.82	$17.26
2020	$3.55	$3.57	$9.88	$17.75
2021	$3.63	$3.59	$9.88	$18.10
2022	$3.71	$4.09	$9.94	$18.36
2023	$3.80	$4.30	$10.06	$18.69
2024	$3.88	$4.51	$10.25	$19.00
2025	$3.96	$4.84	$10.37	$19.48
2026	$4.05	$5.12	$10.43	$19.84
Average Growth Rate	2.2%	3.0%	1.0%	3.7%

[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 in the mid $3.30 per MMBtu and the five-year NYMEX Natural Gas forward curve is projecting the price to remain under $4.00 per MMBtu.

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.

FGT's total receipt point capacity is in excess of 3.0 billion cubic feet per day and includes connections with 12 interstate and 12 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 12 interstate and 12 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 is considering purchasing additional pipeline capacity.

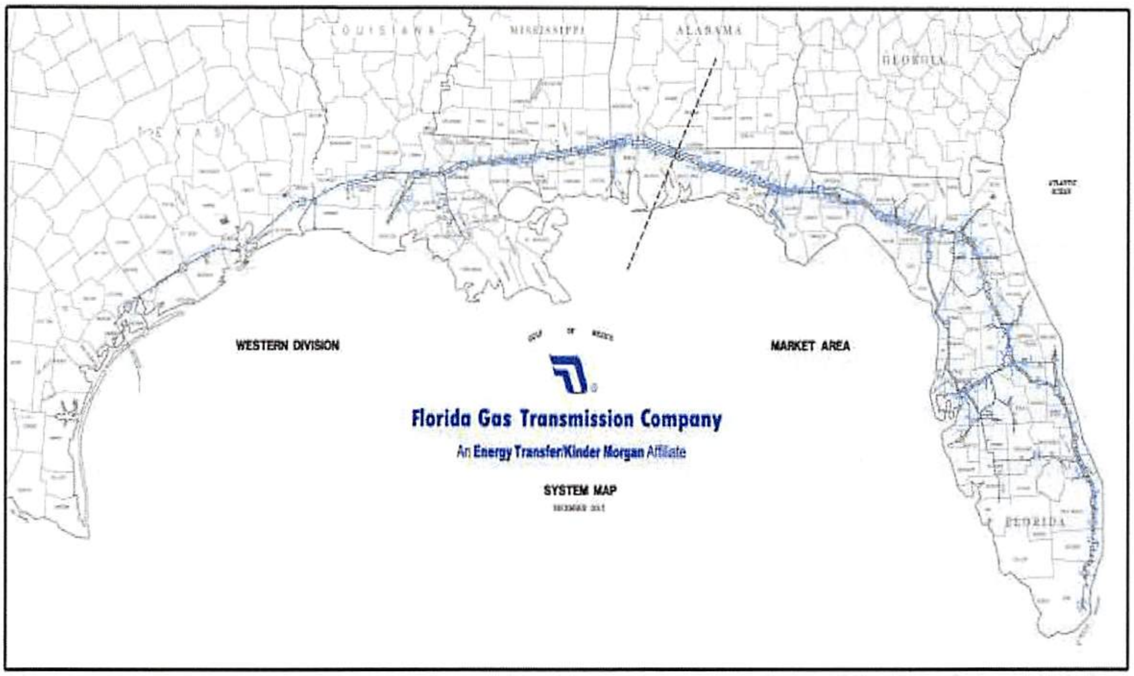

Figure 5-1
Florida Gas Transmission Company System Map

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 5-2 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.

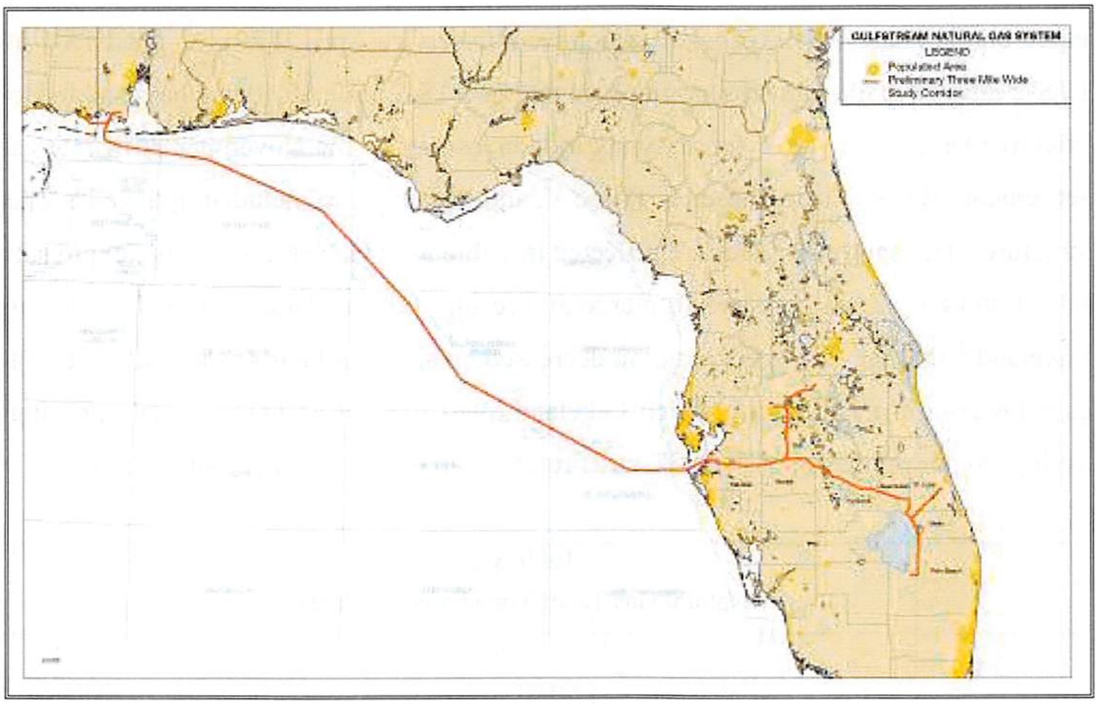

Figure 5-2
Gulfstream Natural Gas Pipeline

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 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	94.55	55.00	70.41
Usage	1.13	1.13	-0.20	0.00	0.0213	0.0068
Total	56.31	66.31	132.79	94.55	55.0213	70.4168
Fuel Charge	3.10%	3.10%	3.10%	3.10%	1.70%	1.70%

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

[1] 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 100 percent of Lakeland Electric's annual requirements for calendar 2017. Under normal supply conditions, Lakeland maintains a 40 – 75 day coal supply reserve (100,000 –150,000 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 620,000 tons of coal per year. The coal sources are located in southwest Indiana, western Kentucky, southern Illinois, Pennsylvania, West Virginia, Tennessee, Alabama and North & South Carolina 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 January 2017, which expires on December 31, 2019.

5.3.2.2.3 Coal price forecast

Currently, Lakeland's long term purchase of coal for McIntosh 3 is effective through December 31, 2019. Coal prices are expected to continue increasing this year with stable IB pricing with modest price increases. The plant is pursuing implanting compliance for the 2018 standards on the Flue Desulfurization (FDG) and effluent limitation guideline (ELD) for sulfur, mercury and arsenic to meet EPA regulations.

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 more than 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

					System Peak Demand		Reserve Margin		Excess/ (Deficit) to Maintain 15% Reserve Margin	
Year	Net Generating Capacity (MW)	Net System Purchases (MW)	Net System Sales (MW)	Net System Capacity (MW)	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)
2017/18	890	0	0	890	687	687	29.5	29.5	100	100
2018/19	890	0	0	890	695	695	28.1	28.1	91	91
2019/20	890	0	0	890	699	699	27.3	27.3	86	86
2020/21	890	0	0	890	702	702	26.8	26.8	83	83
2021/22	890	0	0	890	710	710	25.4	25.4	74	74
2022/23	890	0	0	890	718	718	24.0	24.0	64	64
2023/24	890	0	0	890	729	729	22.1	22.1	52	52
2024/25	890	0	0	890	735	735	21.1	21.1	45	45
2025/26	890	0	0	890	744	744	19.6	19.6	34	34
2026/27	890	0	0	890	753	753	18.2	18.2	24	24

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

					System Peak Demand		Reserve Margin		Excess/ (Deficit) to Maintain 15% Reserve Margin	
Year	Net Generating Capacity (MW)	Net System Purchases (MW)	Net System Sales (MW)	Net System Capacity (MW)	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)
2017	844	0	0	844	641	641	31.7	31.7	107	107
2018	844	0	0	844	649	649	30.0	30.0	98	98
2019	844	0	0	844	654	654	29.1	29.1	92	92
2020	844	0	0	844	659	659	28.1	28.1	86	86
2021	844	0	0	844	664	664	27.1	27.1	80	80
2022	844	0	0	844	671	671	25.8	25.8	72	72
2023	844	0	0	844	679	679	24.3	24.3	63	63
2024	844	0	0	844	687	687	22.9	22.9	54	54
2025	844	0	0	844	695	695	21.4	21.4	45	45
2026	844	0	0	844	702	702	20.2	20.2	37	37

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 if all existing large units are available. After Lakeland Electric (LE) retired McIntosh 1 Steam Unit in December 2015, LE has occasionally purchased capacity when the larger units (i.e., Unit 5 and Unit 3) were in outages. Short-term deficits were fulfilled from market purchases. Taking consideration of maintaining capacity and adequate reliability under various future scenarios, LE is continuously evaluating new supply/demand-side options along with existing resources to provide affordable/economic supply of electrical power for our ratepayers. In addition, there is slower than expected load growth in current and projected future demand of electricity, which is likely due to shifts in customer behavior (voluntary conservation), increase in government efficiency standards, and limited customer growth in the Lakeland territory.

7.1 Reliability and Security of Power Supply

The purpose of the Generation Expansion Plan is to maintain a reliable and affordable power supply portfolio in a system. In the U.S. power systems, 1-in-10 reliability standard (1 day equivalent of loss of load hours in 10 years) is a well adopted benchmark while developing a supply portfolio. This reliability benchmark, in most cases, translates into the requirement of 15% reserve margin in long-term planning. LE is committed not only to plan for meeting the present energy requirement, but also the additional 15% reserve capacity. This is needed because 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 an agreement with other Florida Municipal Power Pool (FMPP) members (i.e., OUC and FMPA), to dispatch all available members' generating resources to meet the total energy demand and maintain sufficient capacity, since the reserve margin is an individual member's responsibility.

As far as daily operating reliability is concerned, FRCC, as per the NERC criteria, requires its member utilities (including LE) to have operating reserve capacity (contingency reserves) to maintain the continuous supply and demand balance at all time. This is required to provide voltage regulation and local system protection as well as to compensate for load forecast error and equipment outage, as per NERC standard (BAL-002-0). In this context, FMPP, as a representative for Lakeland Electric, uses power exchange agreements with other neighboring utilities (such as, Duke Energy, TECO, and FP&L) encompassing 10 different Balancing Authorities in an emergency (contingency) 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 individual native load requirement. The FRSG contingency reserves are maintained at this greater value to its most severe single contingency. The FRSG adjusts 102% for the most severe single contingency loss of capacity in Florida (i.e., 1386 MW, Cape Canaveral Unit) and adjusts to 1414 MW for contingency reserve in 2017. Contingency reserves may be comprised of different generating resources and interruptible load that are available within 15 minutes after the reportable disturbance. As of December 2016, FMPP and Lakeland Electric's share of contingency reserves was 114 MW and 27 MW, respectively. As a part of FMPP agreement, each member also plans for the 10% of the generation reserves over the projected annual peak for the next year.

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 2017 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, 2016

(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	16	11/62	Unknown	11,250	10	14
	3		GT	NG	DFO	PL	TK	16	12/62	Unknown	11,250	9	13
	8		CA	WH	---	---	---	---	04/56	Unknown	26,000	29	31
	8		CT	NG	DFO	PL	TK	3	07/92	Unknown	88,000	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, 2016

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	20,000	16	19
	2		ST	NG	RFO	PL	TK	14	06/76	Unknown	114,700	106	106
	3[1]		ST	BIT	---	RR	TK	NR	09/82	Unknown	219,000	205	205
	5		CT	NG	---	PL	---	NR	05/01	Unknown	245,000	213	233
	5		CA	WH	---	---	---	NR	05/02	Unknown	120,000	125	121
Plant Total												670	689
System Total												**844**	**890**

[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

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
2007	253,027	2.52	1,444	100,524	14,365	781	11,898	65,641
2008	252,731	2.51	1,383	100,739	13,729	762	11,914	63,958
2009	253,084	2.51	1,417	100,641	14,080	749	11,836	63,282
2010	253,009	2.51	1,530	100,719	15,191	753	11,806	63,781
2011	260,567	2.59	1,437	100,784	14,258	744	11,786	63,126
2012	262,288	2.59	1,343	101,252	13,264	727	11,765	61,793
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	12,022	62,552
2015	274,861	2.63	1,468	104,581	14,037	789	12,157	64,901
2016	279,331	2.64	1,473	105,932	13,905	795	12,225	65,031
Forecast								
2017	283,472	2.64	1,457	107,259	13,584	815	12,407	65,689
2018	287,668	2.65	1,475	108,701	13,569	830	12,560	66,083
2019	291,914	2.65	1,490	110,207	13,520	841	12,685	66,299
2020	296,178	2.65	1,493	111,744	13,361	849	12,772	66,474
2021	300,389	2.65	1,506	113,281	13,294	860	12,847	66,942
2022	304,545	2.65	1,522	114,791	13,259	874	12,932	67,584
2023	308,683	2.65	1,540	116,273	13,245	890	13,026	68,325
2024	312,795	2.66	1,560	117,742	13,249	906	13,117	69,071
2025	316,869	2.66	1,580	119,201	13,255	922	13,206	69,817
2026	320,923	2.66	1,600	120,646	13,262	937	13,296	70,472

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
2007	615	88	6,988,636	0	31	77	2,949
2008	607	87	6,977,011	0	32	74	2,859
2009	590	84	7,023,810	0	33	71	2,860
2010	581	84	6,916,667	0	33	69	2,966
2011	578	86	6,720,930	0	33	73	2,864
2012	579	81	7,148,148	0	33	70	2,751
2013	618	79	7,822,785	0	33	70	2,831
2014	649	77	8,428,571	0	33	70	2,903
2015	670	76	8,815,789	0	34	73	3,034
2016	655	74	8,851,351	0	34	73	3,030
Forecast							
2017	672	74	9,081,081	0	34	73	3,051
2018	685	75	9,133,333	0	34	73	3,097
2019	695	76	9,144,737	0	34	73	3,134
2020	699	76	9,197,368	0	34	73	3,148
2021	703	76	9,250,000	0	35	74	3,177
2022	710	77	9,220,779	0	35	74	3,215
2023	717	77	9,311,688	0	35	74	3,256
2024	725	77	9,415,584	0	35	75	3,301
2025	732	78	9,384,615	0	35	75	3,343
2026	739	78	9,474,359	0	35	75	3,386

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
2007	0	0	3,068	9,869	122,379
2008	0	0	2,975	9,685	122,425
2009	0	0	2,992	9,430	121,991
2010	0	0	3,118	9,207	121,815
2011	0	0	2,893	9,070	121,725
2012	0	0	2,873	8,953	122,050
2013	0	0	2,919	8,892	122,803
2014	0	0	3,006	8,820	124,019
2015	0	0	3,126	8,860	125,674
2016	0	0	3,116	8,921	127,152
Forecast					
2017	0	0	3,151	8,920	128,660
2018	0	0	3,198	8,945	130,281
2019	0	0	3,236	8,979	131,946
2020	0	0	3,251	9,012	133,605
2021	0	0	3,281	9,046	135,250
2022	0	0	3,320	9,080	136,880
2023	0	0	3,363	9,115	138,491
2024	0	0	3,409	9,149	140,085
2025	0	0	3,452	9,184	141,669
2026	0	0	3,497	9,219	143,240

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
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
2016	646	0	646	0	0	0	0	0	646
Forecast									
2017	641	0	641	0	0	0	0	0	641
2018	649	0	649	0	0	0	0	0	649
2019	654	0	654	0	0	0	0	0	654
2020	659	0	659	0	0	0	0	0	659
2021	664	0	664	0	0	0	0	0	664
2022	671	0	671	0	0	0	0	0	671
2023	679	0	679	0	0	0	0	0	679
2024	687	0	687	0	0	0	0	0	687
2025	695	0	695	0	0	0	0	0	695
2026	702	0	702	0	0	0	0	0	702

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
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
2016	646	0	646	0	0	0	0	0	646
Forecast									
2017	638	0	638	0	0	0	0	0	638
2018	645	0	645	0	0	0	0	0	645
2019	651	0	651	0	0	0	0	0	651
2020	655	0	655	0	0	0	0	0	655
2021	660	0	660	0	0	0	0	0	660
2022	667	0	667	0	0	0	0	0	667
2023	675	0	675	0	0	0	0	0	675
2024	683	0	683	0	0	0	0	0	683
2025	690	0	690	0	0	0	0	0	690
2026	698	0	698	0	0	0	0	0	698

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
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
2016	646	0	646	0	0	0	0	0	646
Forecast									
2017	642	0	642	0	0	0	0	0	642
2018	650	0	650	0	0	0	0	0	650
2019	656	0	656	0	0	0	0	0	656
2020	660	0	660	0	0	0	0	0	660
2021	665	0	665	0	0	0	0	0	665
2022	672	0	672	0	0	0	0	0	672
2023	680	0	680	0	0	0	0	0	680
2024	688	0	688	0	0	0	0	0	688
2025	696	0	696	0	0	0	0	0	696
2026	704	0	704	0	0	0	0	0	704

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)
					Residential		Comm./Ind.		
Year	Total	Wholesale	Retail	Interrupt.	Load Management	Conservation	Load Management	Conservation	Net Firm Demand
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
2016/17	677	0	677	0	0	0	0	0	677
Forecast									
2017/18	687	0	687	0	0	0	0	0	687
2018/19	695	0	695	0	0	0	0	0	695
2019/20	699	0	699	0	0	0	0	0	699
2020/21	702	0	702	0	0	0	0	0	702
2021/22	710	0	710	0	0	0	0	0	710
2022/23	718	0	718	0	0	0	0	0	718
2023/24	729	0	729	0	0	0	0	0	729
2024/25	735	0	735	0	0	0	0	0	735
2025/26	744	0	744	0	0	0	0	0	744
2026/27	753	0	753	0	0	0	0	0	753

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)
					Residential		Comm./Ind.		
Year	Total	Wholesale	Retail	Interrupt.	Load Management	Conservation	Load Management	Conservation	Net Firm Demand
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
2016/17	672	0	672	0	0	0	0	0	672
Forecast									
2017/18	682	0	682	0	0	0	0	0	682
2018/19	690	0	690	0	0	0	0	0	690
2019/20	694	0	694	0	0	0	0	0	694
2020/21	697	0	697	0	0	0	0	0	697
2021/22	705	0	705	0	0	0	0	0	705
2022/23	713	0	713	0	0	0	0	0	713
2023/24	724	0	724	0	0	0	0	0	724
2024/25	730	0	730	0	0	0	0	0	730
2025/26	738	0	738	0	0	0	0	0	738
2026/27	747	0	747	0	0	0	0	0	747

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)
					Residential		Comm./Ind.		
Year	Total	Wholesale	Retail	Interrupt.	Load Management	Conservation	Load Management	Conservation	Net Firm Demand
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
2016/17	678	0	678	0	0	0	0	0	678
Forecast									
2017/18	688	0	688	0	0	0	0	0	688
2018/19	696	0	696	0	0	0	0	0	696
2019/20	700	0	700	0	0	0	0	0	700
2020/21	704	0	704	0	0	0	0	0	704
2021/22	711	0	711	0	0	0	0	0	711
2022/23	720	0	720	0	0	0	0	0	720
2023/24	731	0	731	0	0	0	0	0	731
2024/25	737	0	737	0	0	0	0	0	737
2025/26	745	0	745	0	0	0	0	0	745
2026/27	754	0	754	0	0	0	0	0	754

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 Sales	Residential Conservation	Comm./Ind. Conservation	Retail	Wholesale	Utility Use & Losses	Net Energy for Load	Load Factor %
2007	2,949	0	0	2,949	0	119	3,068	54.05%
2008	2,859	0	0	2,859	0	116	2,975	49.65%
2009	2,860	0	0	2,860	0	132	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	49.67%
2012	2,751	0	0	2,751	0	122	2,873	53.58%
2013	2,831	0	0	2,831	0	88	2,919	55.37%
2014	2,903	0	0	2,903	0	103	3,006	54.73%
2015	3,034	0	0	3,034	0	92	3,126	54.44%
2016	3,030	0	0	3,030	0	86	3,116	55.02%
Forecast								
2017	3,051	0	0	3,051	0	100	3,151	53.11%
2018	3,097	0	0	3,097	0	101	3,198	53.17%
2019	3,134	0	0	3,134	0	102	3,236	53.16%
2020	3,148	0	0	3,148	0	103	3,251	53.11%
2021	3,177	0	0	3,177	0	104	3,281	53.32%
2022	3,215	0	0	3,215	0	105	3,320	53.37%
2023	3,256	0	0	3,256	0	107	3,363	53.44%
2024	3,301	0	0	3,301	0	108	3,409	53.36%
2025	3,343	0	0	3,343	0	109	3,452	53.59%
2026	3,386	0	0	3,386	0	111	3,497	53.68%

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

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year	Total Sales	Residential Conservation	Comm./Ind. Conservation	Retail	Wholesale	Utility Use & Losses	Net Energy for Load
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
2016	3,030	0	0	3,030	0	86	3,116
Forecast							
2017	3,032	0	0	3,032	0	99	3,131
2018	3,078	0	0	3,078	0	100	3,178
2019	3,114	0	0	3,114	0	101	3,215
2020	3,128	0	0	3,128	0	102	3,230
2021	3,157	0	0	3,157	0	103	3,260
2022	3,195	0	0	3,195	0	104	3,299
2023	3,235	0	0	3,235	0	106	3,341
2024	3,280	0	0	3,280	0	107	3,387
2025	3,321	0	0	3,321	0	109	3,430
2026	3,364	0	0	3,364	0	110	3,474

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

(1) Year	(2) Total Sales	(3) Residential Conservation	(4) Comm./Ind. Conservation	(5) Retail	(6) Wholesale	(7) Utility Use & Losses	(8) Net Energy for Load
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
2016	3,030	0	0	3,030	0	86	3,116
Forecast							
2017	3,070	0	0	3,070	0	101	3,171
2018	3,117	0	0	3,117	0	101	3,218
2019	3,153	0	0	3,153	0	103	3,256
2020	3,169	0	0	3,169	0	103	3,272
2021	3,198	0	0	3,198	0	104	3,302
2022	3,236	0	0	3,236	0	106	3,342
2023	3,277	0	0	3,277	0	107	3,384
2024	3,323	0	0	3,323	0	108	3,431
2025	3,365	0	0	3,365	0	110	3,475
2026	3,408	0	0	3,408	0	112	3,520

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		2017 Forecast		2018 Forecast	
	Peak Demand[1] MW	NEL GWh	Peak Demand[1] MW	NEL GWh	Peak Demand[1] MW	NEL GWh
January	589	235	677	249	687	252
February	564	221	570	207	578	210
March	495	234	478	236	485	239
April	556	235	537	246	543	250
May	566	273	595	291	602	295
June	622	297	624	293	631	297
July	646	319	641	305	649	310
August	646	310	635	315	643	319
September	598	292	605	284	613	289
October	579	258	568	259	575	263
November	441	214	458	220	466	224
December	455	228	498	246	507	250

[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	2016-Actual	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
(1)	Nuclear		Trillion Btu	0	0	0	0	0	0	0	0	0	0	0
(2)	Coal		1000 Ton	379	451	266	224	227	242	266	304	330	425	336
(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	1	3	2	0	0	0	0	0	1	0	1
(10)		Total	1000 BBL	1	3	2	0	0	0	0	0	1	0	1
(11)	Natural Gas	Steam	1000 MCF	945	349	373	230	271	214	259	270	367	391	446
(12)		CC	1000 MCF	13,149	13,384	18,495	19,039	18,165	17,543	19,393	18,311	18,561	18,392	18,002
(13)		CT	1000 MCF	3	20	12	1	0	0	0	0	6	0	6
(14)		Total	1000 MCF	14,097	13,753	18,880	19,270	18,436	17,757	19,652	18,581	18,934	18,783	18,454
(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	2016-Actual	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
(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	805	1009	593	492	504	533	600	685	746	964	763
(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	2	1	0	0	0	0	0	1	0	0
(11)		Total	GWh	0	2	1	0	0	0	0	0	1	0	0
(12)	Natural Gas	Steam	GWh	64	28	31	18	21	17	21	22	31	32	38
(13)		CC	GWh	1793	1939	2696	2779	2648	2556	2828	2668	2702	2664	2605
(14)		CT	GWh	0	1	1	0	0	0	0	0	0	0	0
(15)		Total	GWh	1,857	1,968	2,728	2,797	2,669	2,573	2,849	2,690	2,733	2,696	2643
(16)	NUG			0	0	0	0	0	0	0	0	0	0	0
(17)	Solar			24	39	39	39	39	39	39	39	39	39	39
(18)	Other (Specify)[1]			430	133	-163	-92	39	136	-168	-51	-110	-247	52
(19)	Net Energy for Load		GWh	3,116	3,151	3,198	3,236	3,251	3,281	3,320	3,363	3,409	3,452	3,497

[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	2016-Actual	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
(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		%	25.83	32.02	18.54	15.20	15.50	16.25	18.07	20.37	21.88	27.93	21.82
(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	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
(11)		Total	%	0.00	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
(12)	Natural Gas	Steam	%	2.05	0.89	0.97	0.56	0.65	0.52	0.63	0.65	0.91	0.93	1.09
(13)		CC	%	57.54	61.54	84.30	85.88	81.45	77.90	85.18	79.33	79.26	77.17	74.49
(14)		CT	%	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(15)		Total	%	59.60	62.46	85.30	86.43	82.10	78.42	85.81	79.99	80.17	78.10	75.58
(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		%	0.77	1.24	1.22	1.21	1.2	1.19	1.17	1.16	1.14	1.13	1.12
	Other (Specify)[1]		%	13.80	4.22	-5.10	-2.84	1.20	4.15	-5.06	-1.52	-3.23	-7.16	1.49
(18)	Net Energy for Load		%	100	100	100	100	100	100	100	100	100	100	100

[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	%
2017	844	0	0	0	844	641	203	32	0	203	32
2018	844	0	0	0	844	649	195	30	0	195	30
2019	844	0	0	0	844	654	190	29	0	190	29
2020	844	0	0	0	844	659	185	28	0	185	28
2021	844	0	0	0	844	664	180	27	0	180	27
2022	844	0	0	0	844	671	173	26	0	173	26
2023	844	0	0	0	844	679	165	24	0	165	24
2024	844	0	0	0	844	687	157	23	0	157	23
2025	844	0	0	0	844	695	149	21	0	149	21
2026	844	0	0	0	844	702	142	20	0	142	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	%
2017/18	890	0	0	0	890	687	203	30	0	203	30
2018/19	890	0	0	0	890	695	195	28	0	195	28
2019/20	890	0	0	0	890	699	191	27	0	191	27
2020/21	890	0	0	0	890	702	188	27	0	188	27
2021/22	890	0	0	0	890	710	180	25	0	180	25
2022/23	890	0	0	0	890	718	172	24	0	172	24
2023/24	890	0	0	0	890	729	161	22	0	161	22
2024/25	890	0	0	0	890	735	155	21	0	155	21
2025/26	890	0	0	0	890	744	146	20	0	146	20
2026/27	890	0	0	0	890	753	137	18	0	137	18

[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.