FILED MAY 27, 2014
DOCUMENT NO. 02529-14
FPSC - COMMISSION CLERK

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for Determination of Need for Citrus County Combined Cycle Power Plant	)))	DOCKET NO. _____ Submitted for filing: May 27, 2014

DUKE ENERGY FLORIDA, INC.'S NOTICE OF FILING

Duke Energy Florida, Inc. ("DEF" or the "Company") hereby gives notice of filing the Direct Testimony of Mark E. Landseidel with Exhibits MEL-1 through MEL-5 in support of DEF's Petition for Determination of Need for the Citrus County Combined Cycle Power Plant.

Respectfully submitted this 27th day of May, 2014.

/s/ James Michael Walls

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for Determination of Need for Citrus County Combined Cycle Power Plant	DOCKET NO. _____ Submitted for filing: May 27, 2014

DIRECT TESTIMONY
OF MARK E. LANDSEIDEL

ON BEHALF OF
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IN RE: PETITION FOR DETERMINATION OF NEED

BY DUKE ENERGY FLORIDA, INC.

FPSC DOCKET NO. _____

DIRECT TESTIMONY OF MARK E. LANDSEIDEL

I. INTRODUCTION AND QUALIFICATIONS.

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

A. My name is Mark E. Landseidel and I am employed by Duke Energy Corporation. My business address is 400 South Tryon Street, Charlotte, North Carolina.

Q. Please tell us your position with Duke Energy and describe your duties and responsibilities in that position.

A. I am the Director of Project Development and Initiation in the Duke Energy Corporation Project Management and Construction ("PMC") Department. In this role, I am responsible for the initiation and development of major non-nuclear generation projects for Duke Energy Florida, Inc. ("DEF" or the "Company"). As Director of Project Development, I have responsibility and management oversight for the Citrus County Combined Cycle Power Plant Project for the Company.

Q. Please summarize your educational background and employment experience.

A. I graduated from Colorado State University in May 1982 with a Bachelor of Science in Engineering. I completed the General Manager Program at Harvard Business School in November 2001. I am a certified Project Management Professional. I

joined Duke Energy Corporation in July 1982 and I have worked in a number of departments including plant operations, plant maintenance, business development, and project management and construction in my 32 year career with Duke Energy Corporation. I have been responsible for project development, project management and construction of a number of major projects since August 1996, including responsibility for the initiation, development, and construction for combustion turbine and combined cycle generation plants, including the Buck and Dan River 2X1 combined cycle projects in North Carolina, which completed in 2011 and 2012 respectively. I assumed my current position with Duke Energy Corporation in July 2012.

II. PURPOSE AND SUMMARY OF TESTIMONY.

Q. What is the purpose of your testimony in this proceeding?

A. I am testifying on behalf of the Company in support of its Petition for Determination of Need for the Citrus County Combined Cycle Power Plant. I will describe and explain the site and unit characteristics for the Citrus County Combined Cycle Power Plant, including the size, equipment, equipment configuration, fuel type, fuel supply mode, and other aspects of the project. I will also explain the estimated costs and projected in-service date for the Citrus County Combined Cycle Power Plant project.

Q. Are you sponsoring any sections of DEF's Need Study?

A. Yes. I am sponsoring the projected costs and projected performance for the Citrus County Combined Cycle Power Plant project in the Need Study.

Q. Are you sponsoring any exhibits to your testimony?

A. Yes. I am sponsoring the following exhibits to my testimony:

- Exhibit No. ____ (MEL-1), a preliminary aerial site plan of the Citrus County Combined Cycle Power Plant site in Citrus County, Florida;
- Exhibit No. ____ (MEL-2), the preliminary general arrangement of the Citrus County Combined Cycle Power Plant at the Citrus County site;
- Exhibit No.___(MEL-3), a copy of the Sargent & Lundy Consulting LLC ("S&L") Citrus County Combined Cycle Station Risk Analysis for Single Fuel Operation;
- Exhibit No. ___ (MEL-4), a table of the major cost items for the Citrus County Combined Cycle Power Plant project; and
- Exhibit No. ___ (MEL-5), the projected schedule and key milestones for completion of the Citrus County Combined Cycle Power Plant project.

Each of these exhibits was prepared under my direction and control, and each is true and accurate.

Q. Please summarize your testimony.

The Citrus County Combined Cycle Power Plant is a highly efficient, state-of-the-art natural gas-fired combined cycle generation plant that when built and placed in commercial operation will provide DEF's customers with reliable, flexible, reasonably priced power generation for more than thirty years. The Citrus County Combined Cycle Power Plant will be located on a site next to the Company's existing Crystal River Energy Center ("CREC") that takes advantage of adjacent CREC and transmission infrastructure for the benefit of DEF customers. The Company has a

detailed schedule and plan for the construction of the Citrus County Combined Cycle Power Plant and plans to bring the Plant on-line on schedule and on budget to meet customer needs in 2018.

III. DESCRIPTION OF THE CITRUS COUNTY SITE.

Q. Please describe the location of the Citrus County Combined Cycle Power Plant project.

A. The Citrus County Combined Cycle Power Plant will be located on a 400 acre parcel in Citrus County, Florida, adjacent to the Company's existing CREC. A preliminary aerial site plan showing the location of the Citrus County Combined Cycle Power Plant is attached as Exhibit No. ___ (MEL-1) to my direct testimony. The Citrus County Combined Cycle Power Plant site is approximately 8 miles from Crystal River, Florida and is approximately 100 miles north of St. Petersburg, Florida. U.S. Road 19/98 (Suncoast Boulevard) runs north and south approximately two miles from the eastern boundary of the Citrus County Combined Cycle Power Plant site.

Q. Where on the site are the power plant blocks located?

A. Exhibit No. ___ (MEL-2) to my direct testimony provides the preliminary general arrangement of the Citrus County Combined Cycle Power Plant project on the Citrus County site. It shows the location of the four combustion turbines ("CTGs"), four heat recovery steam generators ("HRSGs"), two steam turbines ("STGs"), and six generator step-up transformers ("GSUs") that make up the power blocks. In addition, the location of the plant balance of plant equipment including cooling towers, pumps,

tanks, power distribution centers, water treatment building, and administration building are also shown on Exhibit No. ___ (MEL-2).

Q. Are there benefits to DEF and its customers associated with the location of the Citrus County Combined Cycle Power Plant?

A. Yes. The location of the Citrus County Combined Cycle Power Plant near the CREC allows the Company to use existing infrastructure at the CREC to support the Citrus County Combined Cycle Power Plant. For example, locating this power plant adjacent to the CREC allows the Company to use the existing CREC intake canal for sea water makeup for the Citrus County Combined Cycle Power Plant cooling towers and the existing CREC water wells for process makeup water. The Company also will use existing roads into the CREC for access to the Citrus County Combined Cycle Power Plant for construction of the plant and operation of the facility. In addition, one power block will be connected to the CREC 500kV transmission system, effectively replacing the generation from the retired Crystal River ("CR") Unit 3 nuclear unit, and the other power block will be connected to the CREC 230kV transmission system, effectively replacing the CR Unit 1 and CR Unit 2 generation when those coal-fired plants are retired. DEF's ability to use existing infrastructure facilities at the CREC for the Citrus County Combined Cycle Power Plant project avoids the cost of building separate, similar facilities for the project thus providing cost-savings from the synergistic use of Company resources for DEF and its customers.

IV. DESCRIPTION OF THE CITRUS COUNTY COMBINED CYCLE POWER PLANT.

Q. Please describe the Citrus County Combined Cycle Power Plant.

A. The Citrus County Combined Cycle Power Plant will be an advanced class gas turbine, 4 by 2 configuration, 1,640 MegaWatt ("MW") plant built in stages of 820MW each, with the first stage in commercial operation in May 2018 and the second stage in commercial operation in December 2018. As I indicated above, the 4 by 2 configuration will include four CTGs, four HRSGs, two STGS, and six GSUs. The plant will have moderate duct firing capability, which means 50 to 100 MWs of duct fired output of each 820MW block will be available as cost effective peaking capacity. The Citrus County Combined Cycle Power Plant is a natural gas fired, high efficiency plant that involves the generation of electricity in two stages, first by firing the CTGs, and second by using the hot gas from the CTGs to produce steam through the HRSGs which is fed into the STGs to generate additional electricity. This combined-cycle capability makes the most of the input fuel, by burning it and using the waste heat from that process, to generate electricity and, therefore, is a very efficient plant design to produce electrical energy. The combined cycle generation technology is one of the most efficient base load power production technologies available today.

Q. What are the advantages from building a combined cycle power plant?

A. In addition to the high fuel efficiency of the combined cycle technology, the combined cycle power technology is also an operationally flexible power technology. The

combined cycle power plant can easily and quickly adjust its power output up or down. This flexibility allows the Company to manage its system better, with the combined cycle power plant matching system operating characteristics, thus allowing the combined cycle plant to generate power to match the system load. These operating characteristics allow the Citrus County Combined Cycle Power Plant to operate in base load and load following service on DEF's system depending on system needs.

In addition, the Citrus County Combined Cycle Power Plant will have a low environmental impact under all standard operating conditions. Combined cycle power plants operating on natural gas are one of the cleanest sources of fossil fuel power generation. Natural gas is a low sulfur, low nitrogen oxide, low particulate emission plant. In addition to low Nitrogen Oxide ("NOx") combustor technology in the CTGs the NOx emissions will be controlled by a Selective Catalytic Reduction ("SCR") system located in the HRSGs that will reduce NOx emissions even further. The Citrus County Combined Cycle power plant will burn a relatively clean fuel, natural gas, and consequently have a low environmental impact.

Q. What is the fuel source for the Citrus County Combined Cycle Power Plant?

A. Natural gas will be the single fuel source for the Citrus County Combined Cycle Power Plant. The natural gas will be supplied by the Sabal Trail pipeline through a gas lateral to the plant. As explained in the testimony of Jeff Patton, DEF has contracted with Sabal Trail for 300,000 MMBtu/day of firm gas transportation capacity on the Sabal Trail pipeline to support the Citrus County Combined Cycle Power Plant's natural gas needs. Sabal Trail is a new Greenfield interstate natural gas

pipeline project that originates in Alabama, extends through Georgia, and ends in Central Florida. The Florida Public Service Commission ("FPSC" or the "Commission") approved Florida Power & Light Company's ("FPL") petition for prudence determination regarding a new state pipeline system, including FPL's selection of Sabal Trail for the Northern Pipeline Project, in Commission Order No.PSC-13-0505-PAA-EI.

Other gas pipelines into Florida will be available as additional resources in the event of a supply disruption on the Sabal Trail pipeline. Sabal Trail and DEF plan an additional receipt-only interconnect between Sabal Trail and Florida Gas Transmission Company, LLC ("FGT") in Citrus County, Florida. The interconnections with FGT in Suwannee County, Florida and Citrus County, Florida would be within the primary transportation paths on DEF's current portfolio of firm gas transportation contracts on FGT. In the event of a pipeline disruption or curtailment on Sabal Trail, these interconnects would allow DEF the ability to utilize its FGT contracts or market supply to deliver gas supply into Sabal Trail's mainline in Suwannee County, Florida or into the Citrus County Line in Citrus County, Florida, which is interconnected with the Citrus County Combined Cycle Power Plant. These alternative gas transportation options provide additional, back-up gas transportation and gas supply reliability at the Citrus County Combined Cycle Plant for the Company and its customers. This back up gas pipeline reliability is also explained in the direct testimony of Jeff Patton in this proceeding.

Q. Does DEF plan to have dual fuel capability at the Citrus County Combined Cycle Plant?

A. No. The Citrus County Combined Cycle Plant is not designed to burn fuel oil and therefore the plant will not have dual fuel capability. Dual fuel capability adds additional engineering, design, and construction cost to the plant, including the cost for dual fuel CTGS, fuel oil unloading facilities, fuel storage tanks, water tanks and associated pumps and pipes. In addition, dual fuel capability adds additional environmental costs associated with permitting, and operations costs related to receiving, storing, and burning fuel oil at the site. The Company weighed these costs and risks against the availability of additional fuel supply reliability as a result of the gas pipeline interconnections to the site that I previously discussed and concluded that dual fuel capability was not required.

Q. Did the Company consider gas supply transportation reliability before deciding against dual fuel capability at the Citrus County Combined Cycle Power Plant?

A. Yes. The Company commissioned an independent engineering risk analysis for single fuel operation based on natural gas at the Citrus County Combined Cycle Power Plant. This risk analysis was prepared by Sargent & Lundy ("S&L"). Based on this report, and DEF's own analysis of fuel supply reliability at the Citrus County Combined Cycle Power Plant with and without dual fuel capability, DEF decided that reliance on natural gas as a single fuel source at the Citrus County Combined Cycle Power Plant provided adequate fuel transportation reliability compared to the cost and risk associated with adding dual fuel capabilities at the Plant.

Q. Who is S&L?

A. S&L is a capable and well-recognized engineering firm in the electric utility industry with substantial experience in siting, designing, and engineering work for natural-gas fired, combined cycle generation plants, including the provision of gas transportation facilities for such plants.

Q. What did S&L analyze in its report on the risk of relying on natural gas as a single fuel source for the Citrus County Combined Cycle Power Plant?

A. S&L performed a detailed risk analysis to determine if the frequency and extent of potential gas supply disruptions in the southeastern states affecting the Florida Reliability Coordinating Council ("FRCC") region where the Citrus County Combined Cycle Plant will be located justified back-up fuel capability with low sulfur diesel fuel oil. This analysis considered the risks and costs of using only natural gas as a single source of fuel at the Citrus County Combined Cycle Plant. S&L concluded that the probability of gas curtailments or interruptions was very low, based on historical interruptions and the increasing reliability of the gas transportation system, including the addition of Sabal Trail in Florida. S&L further concluded that the addition of dual fuel capability at the Citrus County Combined Cycle Plant provided a negligible incremental increase in system reliability. S&L determined that natural gas transportation supply interruption risk at the Citrus County Combined Cycle Plant could be mitigated by existing dual fuel capabilities at other natural-gas fired, combined cycle plants on DEF's system and the potential ability to mitigate gas transportation supply interruptions with pipeline redundancies such as pipe looping

and interconnections with other pipelines. A copy of the S&L report is included as Exhibit No. ___ (MEL-3) to my direct testimony.

Q. Was the S&L analysis used by DEF in deciding on a single, natural gas fuel source for the Citrus County Combined Cycle Plant?

A. Yes, as I indicated above, DEF relied on this S&L analysis in deciding that dual fuel capability at the Citrus County Combined Cycle Power Plant was not necessary given the gas pipeline transportation reliability redundancy in DEF's plan for the Plant and the costs and risks associated with adding dual fuel capability at the Plant. S&L had confirmed that the risk and extent of gas supply curtailments or interruptions in the FRCC area were very low and even that minimal risk was mitigated by the additional gas transportation reliability provided by adding Sabal Trail as the third main gas pipeline in Florida. Additionally, DEF's gas transportation plan for the Citrus County Combined Cycle Power Plant includes interconnections with other gas pipelines that S&L noted were redundancies that further mitigated the risk of gas supply disruptions and curtailments. As a result, DEF concluded that the additional cost of adding dual fuel capability at the site, and the environmental permitting and mitigation issues associated with burning fuel oil as a backup fuel, were simply unnecessary and not justified by the low risk of gas supply transportation disruption to the Citrus County Combined Cycle Power Plant under the Company's gas supply transportation plan for the Plant.

Q. Will the Citrus County Combined Cycle Power Plant be the only such Plant without dual fuel capability?

A. No. S&L analyzed this issue in its report and concluded that of the forty natural gas-fired, combined cycle generation plants with generating capacity of 200MW or more in the FRCC area, seventeen (17) have no backup fuel capability. These seventeen plants without dual fuel capability rely on natural gas as a single fuel source for generation. These plants account for forty-three (43) percent of the total generating plants. See the S&L report attached as Exhibit No. ___ (MEL-3) to my direct testimony. In addition, most of DEF's other combined cycle power plants have dual fuel capability, thereby providing this resource reliability on DEF's system.

Q. How does the Company plan to construct the Citrus County Combined Cycle power plant?

A. DEF will purchase the major equipment, the CTGs, HRSGs, STGs, and GSUs, directly from the manufacturer based on competitive requests for proposals ("RFPs") with qualified, industry-leading equipment manufacturers. DEF will build the plant through a competitive RFP to qualified constructors for the primary engineering, procurement, and construction ("EpC") contract. The major equipment and EpC contracts will be fixed price contracts with appropriate contract provisions to appropriately share and minimize DEF's procurement and construction risk. DEF has experience with this contracting approach, having successfully executed several combined cycle gas turbine projects with it including Buck, H.F. Lee, Dan River, and Sutton.

Q. What will it cost to build the Citrus County Combined Cycle power plant?

A. The total project cost, including the allowance for funds used during construction ("AFUDC") and transmission interconnection costs, is $1,514 million (nominal). A breakdown of the major cost items for the Citrus County Combined Cycle Power Plant project is included as Exhibit No. ___ (MEL-4) to my direct testimony. As can be seen on Exhibit No.__(MEL-4), EpC and major equipment procurement represents approximately 83% of the project cost (not including AFUDC). As discussed above, firm/fixed price bids for the major equipment and the EpC have been received from RFPs to qualified bidders. As a result, we are confident the costs to build the Citrus County Combined Cycle Power Plant are competitive and will provide generation to our customers at a reasonable cost.

Q. What will it cost to operate the Citrus County Combined Cycle Power Plant?

A. The estimated incremental annual fixed operation and maintenance ("O&M") cost for the Citrus County Combined Cycle Power Plant is approximately $11.3 million, based on the estimate for 2019. As is standard, the largest fixed costs are wages and wage-related overheads for the permanent plant staff and expenses for unplanned equipment maintenance. The Citrus County Combined Cycle Power Plant will employ at least 40 permanent staff to operate the plant in Citrus County.

Variable O&M costs vary as a function of unit generation and as such they are expected to be higher the more the plant operates. These costs include consumables (nondurable goods), chemicals, lubricants, water, and major maintenance costs ,such as planned equipment inspections and overhauls. The estimated variable O&M is

approximately $24.8 million based on the estimate for 2019. These variable O&M cost estimates are based on a 70 percent capacity factor. The Citrus County Combined Cycle Power Plant is expected to operate in a capacity factor range of around 50 percent to almost 90 percent over its expected 35-year life. The Citrus County Combined Cycle Power Plant will have an expected equivalent forced outage rate of only approximately 2 percent. When the Citrus County Combined Cycle Power Plant achieves commercial operation it will be one of the most efficient generation units on DEF's system with an expected summer full load heat rate of approximately 6,701 BTU/kW-hr higher heating value ("HHV").

Q. What is the in-service date for the Citrus County Combined Cycle power plant?

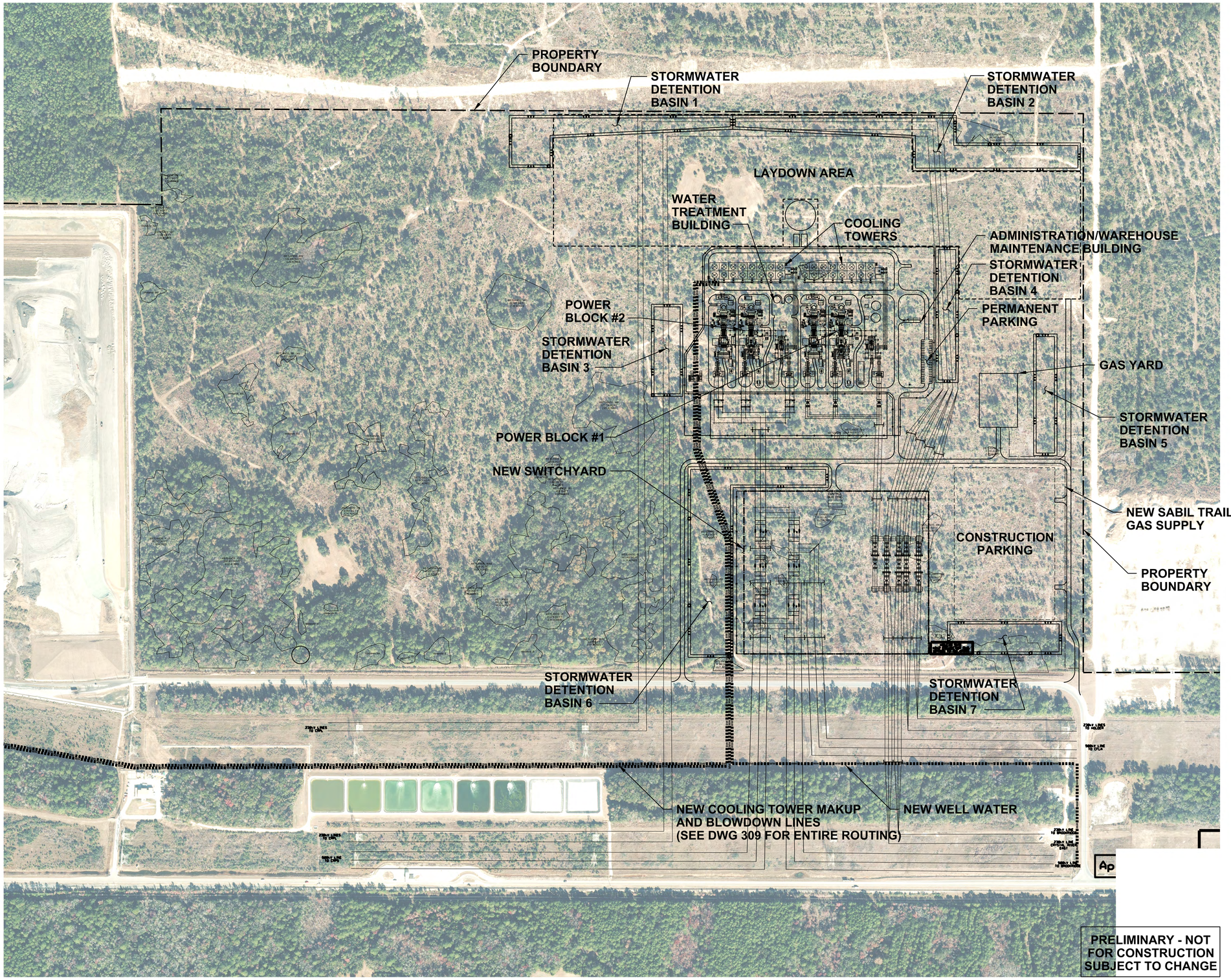
A. The Citrus County Combined Cycle Power Plant will achieve commercial operation in 2018, with 820MW in commercial operation by May 2018, and the remaining 820MW power block in operation by December 2018.

Q. Will the Company meet that in-service date?

A. Yes. The proposed schedule for permitting and constructing the Citrus County Combined Cycle Power Plant and key milestones is included in Exhibit No. ___ (MEL-5) to my direct testimony. Under this schedule major contracts would be issued in October/November 2014, construction would begin in January of 2016, and the project would be completed by December of 2018. In my opinion, this is a reasonable schedule.

Q. Does this conclude your direct testimony?

A. Yes it does.



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1	03/05/14	RNO		ISSUED FOR REVIEW
2	04/01/14	RNO		ISSUED FOR REVIEW
3	5/07/14	RNO		ISSUED FOR REVIEW

0 200' 400'
SCALE IN FEET
NORTH

Burns & McDonnell
SINCE 1898
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400

date MARCH 3, 2014 | detailed R. OWENS
designed R. OWENS | checked

DUKE ENERGY®
CITRUS COUNTY, FLORIDA

HOLCIM SITE
PROPERTY BOUNDARY SITE PLAN
4x2

project 71404 | contract
drawing CS303 | rev. - C
sheet of sheets
file 71404CS303.DGN

5/7/2014

Scale For Microfilming
Millimeters
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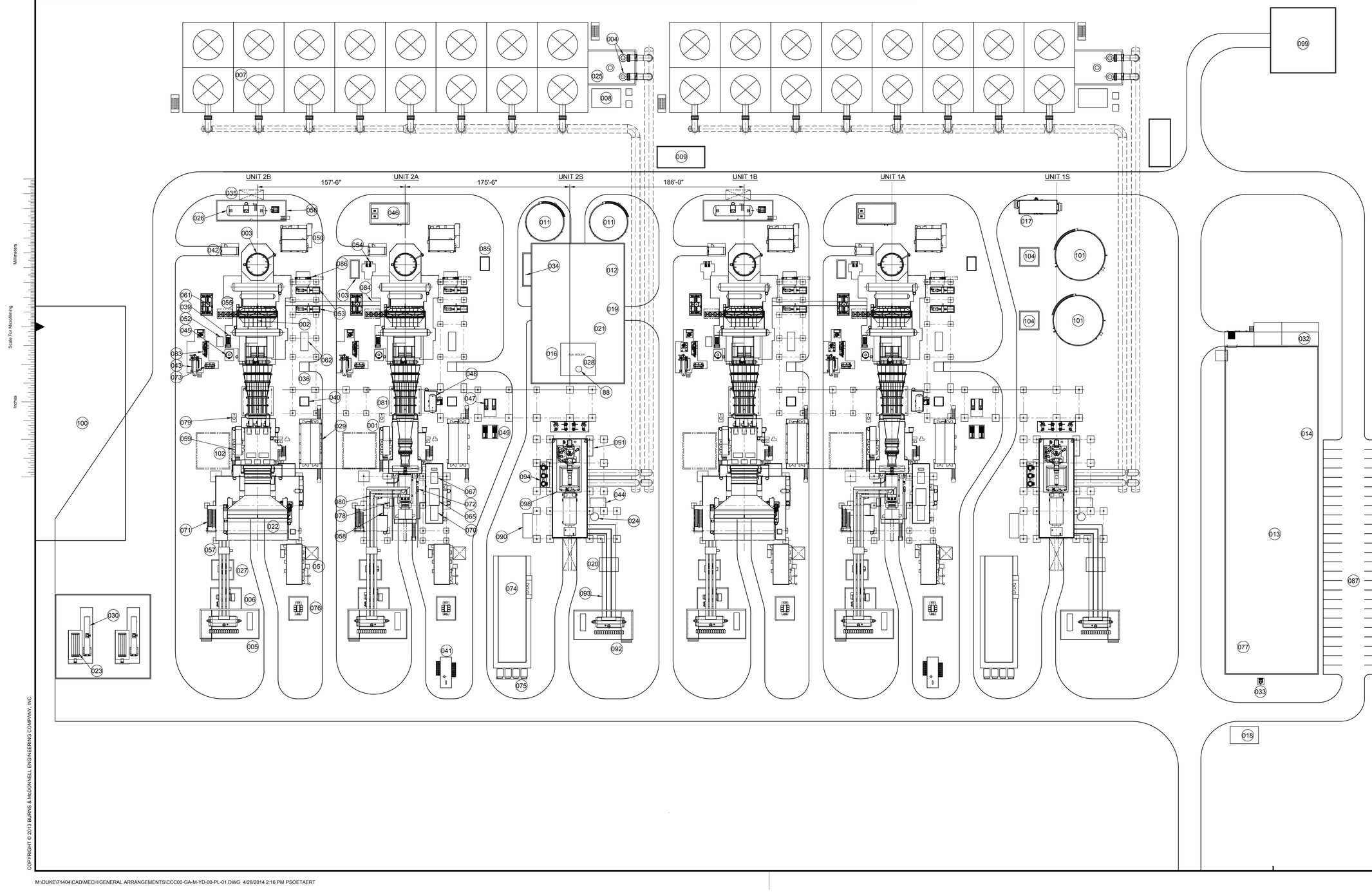
EQUIPMENT IDENTIFICATION AND LOCATION LIST		EQUIPMENT IDENTIFICATION AND LOCATION LIST		EQUIPMENT IDENTIFICATION AND LOCATION LIST		EQUIPMENT IDENTIFICATION AND LOCATION LIST		EQUIPMENT IDENTIFICATION AND LOCATION LIST	
DWG REF	DESCRIPTION	DWG REF	DESCRIPTION	DWG REF	DESCRIPTION	DWG REF	DESCRIPTION	DWG REF	
001	GAS TURBINE GENERATOR (GTG)	024	MISC. DRAINS TANK	047	CLOSED COOLING WATER PUMPS	070	GTG AUXILIARY ENCLOSURE	093	ST ISOPHASE BUS DUCT
002	HEAT RECOVERY STEAM GENERATOR (HRSG)	025	AUXILIARY COOLING WATER PUMP	048	CCW HEAD TANK (ON PIPE RACK)	071	GTG STAIR TOWER	094	CONDENSATE PUMPS
003	HRSG STACK	026	AMMONIA STORAGE	049	CCW HEAT EXCHANGERS	072	GTG LOOP SEAL TANK	095	NOT USED
004	CIRCULATING WATER PUMPS	027	GTG EXCITATION TRANSFORMER	050	HRSG PDC	073	GTG FUEL GAS INLET FILTER	096	NOT USED
005	GT GSU	028	AUX. BOILER	051	GTG STARTING SYSTEM ELECTRICAL ENCLOSURE	074	MAIN PDC	097	NOT USED
006	UNIT AUX TRANSFORMER	029	GTG ELECTRICAL ENCLOSURE	052	HRSG ELEVATOR	075	MAIN PDC SUS TRANSFORMERS	098	STEAM TURBINE ENCLOSURE
007	COOLING TOWER	030	H2 TRUCK UNLOADING	053	BOILER FEED PUMPS	076	GTG STARTING SYSTEM TRANSFORMER	099	OIL STORAGE ENCLOSURE
008	COOLING TOWER PDC	031	NOT USED	054	FUEL GAS COELESCING FILTER	077	CONTROL ROOM	100	STORMWATER POND
009	COOLING TOWER CHEMICAL FEED ENCLOSURE	032	LOADING DOCK	055	CATALYST REMOVAL AREA	078	GTG NGR CUBICLE	101	SERVICE / FIREWATER TANK
010	NOT USED	033	SANITARY LIFT STATION	056	AMMONIA FORWARDING PUMPS	079	GTG BLADE WASHING DRAINS TANK (BELOW GRADE)	102	GTG CRANE PAD
011	DEMINERALIZED WATER TANK	034	COMPRESSED AIR TRIM COOLERS	057	GTG MAIN CIRCUIT BREAKER	080	GTG CO2 FIRE PROTECTION SKID	103	FUEL GAS DEWPOINT HEATER
012	SERVICE ENCLOSURE	035	TRUCK UNLOADING	058	GTG EXCIT ELECTRICAL ENCLOSURE	081	GTG BLADE WASH SKID	104	SERVICE WATER PUMPS
013	ADMIN BUILDING / SHOP	036	NITROGEN STORAGE PAD	059	GTG FUEL GAS ENCLOSURE	082	NOT USED		
014	WAREHOUSE	037	NOT USED	060	NOT USED	083	DUCT BURNER SKID		
015	NOT USED	038	NOT USED	061	AMMONIA FLOW CONTROL	084	OVERHEAD WALKWAY PLATFORM		
016	BOILER CHEMICAL FEED SYSTEM	039	HRSG STAIRTOWER	062	SAMPLE PANEL ENCLOSURE	085	CO2 STORAGE ENCLOSURE		
017	FIRE PUMP ENCLOSURE	040	PHOSPHATE FEED ENCLOSURE	063	NOT USED	086	FGH AFTER COOLER		
018	SEWAGE AEROBIC DIGESTOR (BELOW GRADE)	041	EMERGENCY DIESEL GENERATOR	064	NOT USED	087	PARKING		
019	WATER TREATMENT SYSTEM	042	CEMS ENCLOSURE	065	GTG LUBE OIL UNIT	088	AUX BOILER STACK		
020	ST PT SURGE CUBICLE	043	FUEL GAS PERFORMANCE HEATER	066	NOT USED	089	NOT USED		
021	AIR COMPRESSOR	044	CONDENSATE FILTER/POLISHER	067	GTG CONTROL OIL UNIT	090	ST AREA STAIR TOWER		
022	INLET AIR FILTER (SEE NOTE 1)	045	HRSG BLOWDOWN TANK	068	NOT USED	091	STG LUBE OIL SKID		
023	H2 STORAGE WITH SUN SHADE	046	WASTEWATER COLLECTION SUMP (BELOW GRD)	069	NOT USED	092	ST GSU		



NOTES:
1. GTG INLET AIR FILTER NOT SHOWN ON UNIT 1A & 2A FOR CLARITY.

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

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SCALE IN FEET

Burns & McDonnell
SINCE 1939

date	detailed
MARCH 14, 2014	M. ATHERTON
designed	checked
D. HOFRICHTER	

DUKE ENERGY

CITRUS COUNTY, FLORIDA

HOLCIM SITE
GENERAL ARRANGEMENT

project	contract
71404	

drawing **CCC00-GA-M-YD.00.PL-01 -C** rev.

sheet 1 of 1 sheets

file CC00-GA-YD.00.PL.01dwg

no.	date	by	ckd	description
A	10/26/13	MAA		ISSUED FOR REVIEW
B	11/15/13	MAA		ISSUED FOR BID
C	03/14/14	PS		ISSUED FOR REVIEW
D	04/28/14	PS		ISSUED FOR REVIEW

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Citrus County Combined Cycle Station

Risk Analysis for Single Fuel Operation

Prepared for
Duke Energy Corporation

SL-012009
Revision 1
Project 12698-206
March 2014

Prepared by

Sargent & Lundy LLC
Consulting

55 East Monroe Street • Chicago, IL 60603-5780 USA

Citrus County Combined Cycle Station
Risk Analysis for Single Fuel Operation

Prepared for
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SL-012009
Revision 1
March 2014

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Citrus County Combined Cycle Station
Risk Analysis for Single Fuel Operation

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March 27, 2014
Date

SL-012009
Revision 1
March 2014

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LEGAL NOTICE

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Risk Analysis for Single Fuel Operation

CONTENTS

CONTENTS (cont.)

TABLES AND FIGURES

ACRONYMS AND ABBREVIATIONS

Term	Definition or Clarification
BACT	Best Available Control Technology
CC	Combined Cycle
CTG	Combustion turbine generator
DEP	Department of Environmental Protection
DO	Distillate oil
DOE	United States Department of Energy
FAC	Florida Administrative Code
FGT	Florida Gas Transmission (System)
FPL	Florida Power and Light
FRCC	Florida Reliability Coordinating Council
mmBtu	Million Btu
NAAQS	National Ambient Air Quality Standards
NERC	North American Electric Reliability Corporation
NESHAP	National Emission Standards for Hazardous Air Pollutants
NG	Natural gas
NSPS	New Source Performance Standards
NSR	New Source Review
O&M	Operation and maintenance
PSD	Prevention of Significant Deterioration
S&L	Sargent & Lundy LLC

ACRONYMS AND ABBREVIATIONS (cont.)

Term	Definition or Clarification
scf	Standard cubic feet
SCR	Selective Catalytic Reduction
ULSD	Ultra-low sulfur diesel

EXECUTIVE SUMMARY

Sargent & Lundy (S&L) was retained by Duke Energy to analyze the risks and costs of firing the combustion turbine generators (CTG) of the Citrus County Combined Cycle Station using only a single source of fuel (natural gas) compared to providing that station with backup fuel capability (ultra-low sulfur diesel oil).

NATURAL GAS SUPPLY AND INFRASTRUCTURE

Two pipelines, Florida Gas Transmission and Gulfstream, currently provide 100% of the total natural gas supply capacity into the Florida Reliability Coordinating Council (FRCC). These pipelines enter Florida through Alabama and the Gulf Coast, respectively. A third main pipeline that will provide a significant natural gas supply to FRCC is in the planning stage. The pipeline, called the Sabal Trail Transmission Pipeline, will extend between southwest Alabama and Martin County, Florida, and is scheduled for completion in May 2017. As suggested by the *FRCC 2013 Load & Resource Reliability Assessment Report,*[1] this project will increase reliability throughout Florida by introducing a new supply source and will interconnect the proposed pipeline with the other two main pipelines.

NATURAL GAS CURTAILMENTS

S&L reviewed several sources to locate and identify gas supply disruptions in the southeastern states that may have affected the FRCC region. Among those, the NERC Special Reliability Assessment (May 2013) shows that natural gas supply curtailments have been caused by various factors. These include cold weather events and hurricanes.

- NERC indicates that cold weather events in 1983, 1989, 2003, 2006, 2008, 2010, and 2011 created disruptions in natural gas production, and that the 2003 and 2011 events caused curtailments. The 2003 event occurred in Texas when 5,500 MW of capacity was lost due to gas curtailments for 2–3 days. An estimated 3,200 MW was regained on back-up fuel oil. The 2011 event, also in Texas, curtailed about 14.8 billion cubic feet of gas over 5 days affecting natural gas supply to the southwestern U.S.
- Future supply disruptions due to hurricanes are expected to have less impact because much of the new production of natural gas supply is being obtained from inland shale deposits, which reduces the percentage of natural gas supply from hurricane prone areas.

[1] Florida Reliability Coordinating Council, *FRCC 2013 Load & Resource Reliability Assessment Report*, July 9, 2013.

Another documented cause of curtailment in the NERC Special Reliability Assessment report was a lightning strike in 1998 to the Perry Compressor Station in the Florida Gas Transmission (FGT) System. This event resulted in a reported 1.5 billion cubic feet per day curtailment, but electrical blackouts were avoided through demand-side management by requesting voluntary reduction in electrical consumption. Partial service to the natural gas lines resumed in approximately 3 days; the total impact lasted 5 days.

The infrequent occurrence of significant gas curtailment events due to cold weather, hurricanes, and other weather-related incidents suggests that the probability of occurrence is low, but also difficult to predict. Redundancies built into the system infrastructure, such as pipe looping, interconnections with other pipelines, and storage facilities, have been used to avoid extended supply disruptions and curtailments. Moreover, FRCC has developed an electrical generation shortage plan, which documents procedures to be used by Florida's electric utilities and governmental agencies for response to an energy emergency to increase region-wide reliability.

DUAL FUEL OPERATION

S&L conducted a review of the U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC) Database and a review of permits issued for combined-cycle combustion turbines in Florida to identify expected Best Available Control Technology (BACT) for new combined cycle combustion turbines. Recently permitted single and dual fuel-fired combined-cycle combustion turbines facility projects were permitted with similar combustion control and post-combustion control emissions technologies. For NO_X control, combined-cycle combustion turbine facilities were permitted with Dry Low-NO_X systems when firing natural gas, water injection systems when firing fuel oil, and post-combustion controls, specifically selective catalytic reduction (SCR) systems, to be used when firing natural gas and fuel oil.

Facilities firing diesel fuel oil will likely have a more challenging time demonstrating compliance with the recently updated 1-hour NO_2 and SO_2 National Ambient Air Quality Standards (NAAQS), 100 ppb and 75 ppb, respectively, especially during start-up, since NO_X and SO_2 emissions from firing diesel fuel oil tend to be higher than emissions from firing natural gas. There are many variables that are considered during the air quality impact modeling process, and analyses must be conducted on a case-by-case basis. In the case of dual fuel capability, obtaining an air quality permit will likely be more difficult due to the expected NAAQS compliance challenges.

S&L assessed the prevalence of backup fuel capability in combined cycle plants in FRCC. Forty combined cycle plants were identified, of which 23 (58%) have natural gas as primary fuel and diesel or distillate fuel oil as backup fuel, and 17 (43%) have natural gas as primary fuel but no backup fuel capability. On an installed capacity basis, about half the capacity has backup fuel capability. Furthermore, most of Duke Energy's plants in Florida have backup fuel capability.

SUMMARY

Given the infrequent occurrence of significant historical gas curtailment events and the expected system reliability increase from the Sabal Trail pipeline, the probability of occurrence of gas curtailments is very low. Redundancies built into the system infrastructure, such as pipe looping, interconnections with other pipelines, and storage facilities, have been used to avoid extended supply disruptions and curtailments.

Most of Duke Energy plants in Florida already have backup fuel capability. Additional dual fuel capabilities at the Citrus County Combined Cycle Station after the completion of the Sabal Trail pipeline and its interconnection with the FGT and Gulfstream pipelines would result in only a small incremental impact on system reliability. In addition, FRCC has developed an electrical generation shortage plan, which documents procedures to be used by Florida's electric utilities and governmental agencies for response to an energy emergency to increase region-wide reliability.

Last page of Executive Summary.

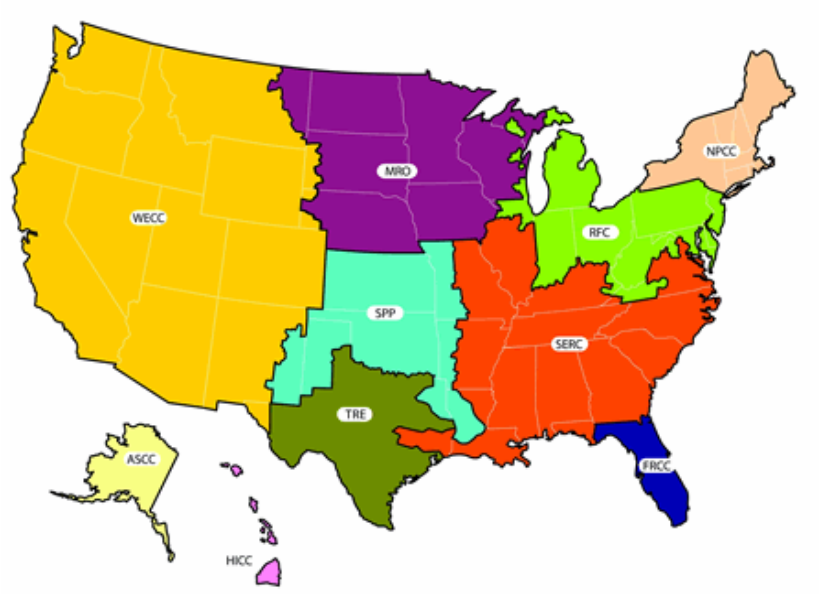
1. INTRODUCTION

This report presents an analysis of the risks and costs of firing the combustion turbine generators (CTG) of the Citrus County Combined Cycle Station using only a single source of fuel (natural gas) versus providing that station with backup fuel capability (ultra-low sulfur diesel oil).

Increased consumption of natural gas for power generation in the U.S. is a concern raised by the North American Electric Reliability Corporation (NERC), a not-for-profit entity whose mission is to ensure the reliability of the Bulk-Power System in North America. NERC conducts reliability assessments of the North American bulk power systems aiming to identify emerging risks and potential reliability problems for electricity production. NERC's assessments are often reviewed by regulators having decision-making responsibilities within the electric sector.

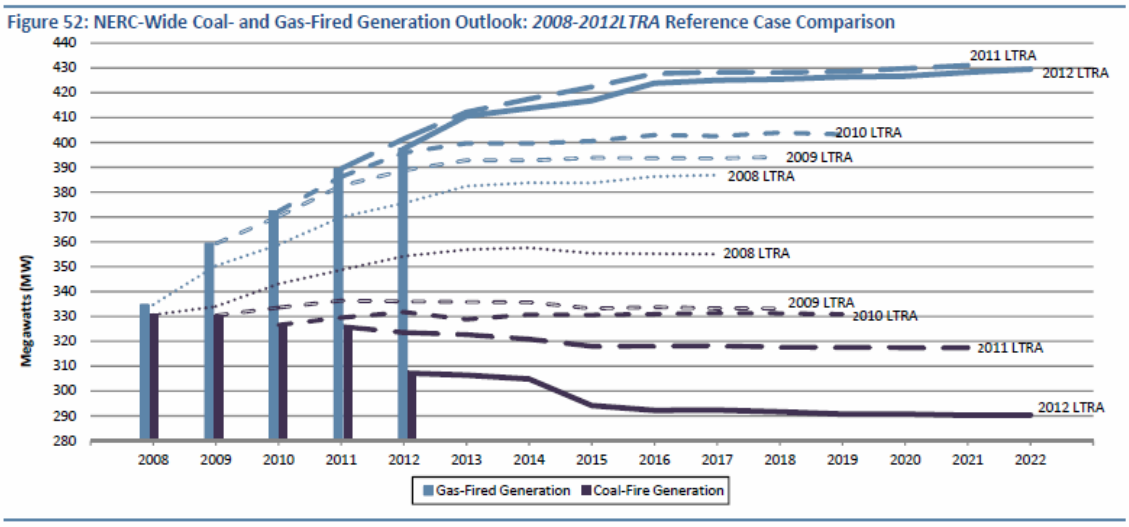
The Florida Reliability Coordinating Council (FRCC) is one of eight reliability regions NERC has established within the contiguous United States to focus reliability analysis on regional variables such as seasonal demand fluctuations, demand response procedures, resource capacity, etc. It covers the state of Florida except for the panhandle area served by Gulf Power Company (see Figure 1-1).

Figure 1-1 — North American Electric Reliability Corporation Regional Entities



Increased dependency on natural gas[2] is among potential high impact reliability risks identified for all the regional NERC entities. NERC projects that over the next ten years natural gas will be the most common fuel source for new electricity generation construction due to its affordability, low emissions, low capital cost of gas-fired plants, and short construction lead times of gas-fired plants relative to alternatives.[3] Figure 1-2 shows the annual projections for installed coal-fired and gas-fired capacity in NERC's Long-Term Reliability Outlook projections of 2008 through 2012, showing the disparity in expected growth between the two types of generation, with gas-fired generation projections growing year on year and coal transitioning from a projection of modest growth in the 2008 projection to a projection of substantial net retirements in the 2012 projection. NERC is concerned about increasing dependency of the bulk power supply system's reliance on natural gas, and the potentially serious effect that natural gas supply interruptions could have on bulk power supply reliability. Florida may be more susceptible to supply problems due to its peninsular geography and limited number of supply sources.

Figure 1-2 — NERC-Wide Coal and Gas Fired Generation Outlook



Source: NERC 2012 Long-Term Reliability Assessment, November 2012, p. 64. Ordinate is shown as MW in the original report but should have been labeled GW.

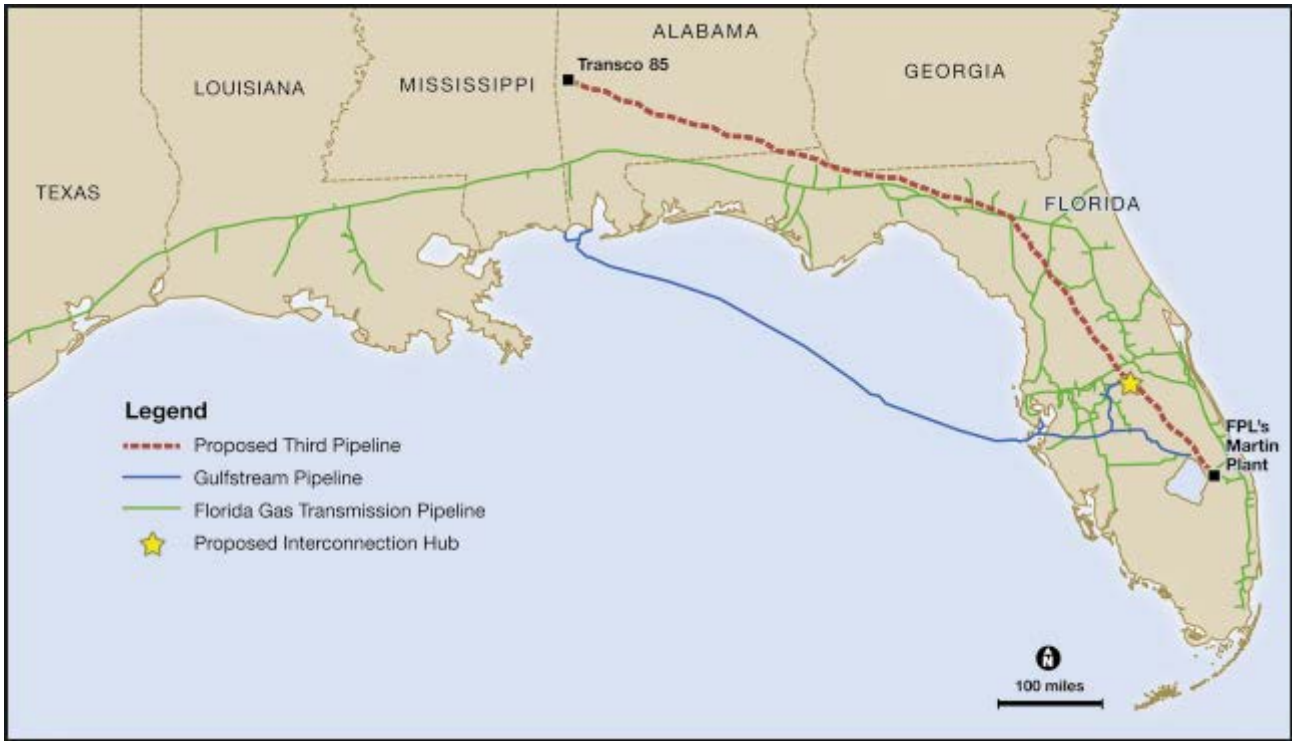
Last page of Section 1.

[2] NERC 2012 Long-Term Reliability Assessment November 2012, pp. 52 through 54.
[3] Figure 1 2, page 64 of above-cited NERC Report.

2. NATURAL GAS SUPPLY AND DEMAND IN FLORIDA

Natural gas is currently supplied to Florida via four pipelines. One of these (Gulf South pipeline) serves the Gulf Power region (Florida panhandle) and is not a factor in supply of the FRCC reliability region. The pipeline of the Southern Natural Gas Company supplies some gas to FRCC, but that fuel flows through the Florida Gas Transmission Company's pipeline and thus is not additive to the capacity of the two largest pipelines in supply to FRCC. Therefore the largest two pipelines, those of Florida Gas Transmission and Gulfstream, currently represent 100% of the total natural gas supply capacity into the FRCC (referred to in this section as the main pipelines). The two main pipelines enter Florida through Alabama and the Gulf Coast. The two minor pipelines supply natural gas primarily to markets outside of Florida; they do supply some natural gas to Florida, but via the larger pipelines. A third main pipeline, Sabal Trail Transmission Pipeline, is in the planning stage and will provide a significant natural gas supply to Florida. Routes of the existing two main pipelines and the planned future pipeline are shown in Figure 2-1.

Figure 2-1 — Routes of Natural Gas Supply Pipelines Serving Florida



The gas capacity supplying the FRCC region from the Gulfstream Pipeline and the Florida Gas Transmission Pipeline totals 4.329 billion cubic feet per day. Capacities of existing and planned pipelines serving Florida are shown in Table 2-1.

Table 2-1 — Florida Natural Gas Pipeline Capacity

Pipeline Owner	Length (miles)	Pipeline Capacity (billion ft^3/day)	Initial Service Year in Florida (2)	Primary Market
Florida Gas Transmission Company LLC	5,300	3.044	2001	Florida, Louisiana, and Alabama
Gulfstream Natural Gas System	745	1.285	2002	Florida
Southern Natural Gas Company	7,600	0.411 (1)	2007	Alabama, Georgia, Mississippi, and Louisiana. Capacity is not additive in supply of FRCC, however.
Gulf South Pipeline Company	7,240	0.190 (Note 1)	1998	Alabama, Louisiana, and Mississippi. Does not serve FRCC.
Total Existing Capacity Supplying FRCC		4.329		
Total Existing Capacity Supplying Florida		4.930		

(1) Southern Natural Gas and Gulf South pipelines do not represent independent supply capacity to FRCC. Gas to FRCC from Southern Natural Gas enters through the FGT pipeline, and the Gulf South pipeline services the panhandle area of Florida, which is outside of FRCC.

(2) Source: United States Department of Energy, Energy Information Administration – naturalgaspipelineprojects.xls

2.1 FLORIDA GAS TRANSMISSION PIPELINE

The Florida Gas Transmission Pipeline (shown in green in Figure 2-1) currently provides approximately 70% of the natural gas pipeline capacity serving FRCC. This pipeline is owned by Florida Gas Transmission Company, LLC and operated by Citrus Corporation. Citrus Corporation is a joint venture between Energy Transfer Partners and Kinder Morgan.[4] The Florida Gas Transmission Pipeline stretches a total of 5,300 miles from southeast Texas to southern Florida along the Gulf Coast region of the United States. The pipeline system operates and maintains over 70 interconnections[5] with major interstate and intrastate natural gas pipelines and has several storage connection points in eastern Mississippi as shown in Figure 2-2. These storage and interconnections help maintain sufficient natural gas supply during peak time periods, and increase reliability.

[4] Yahoo Finance: http://biz.yahoo.com/ic/113/113367.html
[5] Energy Transfer website: www.energytransfer.com/ops_interstate.aspx

Currently, firm transportation capacity on the Florida Gas Transmission Pipeline and on the Gulfstream Pipeline is approximately 96% subscribed on a term basis,[6] which is not adequate for future gas generation growth. Natural gas-fired combined-cycle generation requires firm transportation capacity on pipelines to support reliable full-load operation, particularly during peak periods. On June 1, 2013, The Florida Gas Transmission Company reported a total unsubscribed firm transportation capacity into the Florida Market Area of 123,500 mmBtu/day.

Figure 2-2 — Florida Gas Transmission Pipeline

Source: http://fgttransfer.energytransfer.com/ipost/FGT

2.2 GULFSTREAM PIPELINE

The Gulfstream Pipeline supplies natural gas only to Florida and currently provides approximately 30% of the natural gas pipeline capacity serving FRCC. This pipeline is owned and operated by Gulfstream Natural Gas System, LLC, which is a joint venture between Williams Partners L.P. and Spectra Energy. The Gulfstream Pipeline ranges in size from 16 inches to 36 inches and stretches 745 miles from the Mississippi-Alabama border through the Gulf of Mexico into Tampa Bay area and then extends via land to south central Florida (see Figure 2-3). The pipeline has three compressor stations with a total of 168,000 horsepower. The Gulfstream pipeline was placed into service in 2002 and is the first interstate pipeline to be routed under the Gulf of Mexico.

[6] Florida Reliability Coordinating Council, *FRCC 2013 Load & Resource Reliability Assessment Report*, July 9, 2013.

Figure 2-3 — Gulfstream Pipeline

Source: http://wp.gulfstreamgas.com/

The Gulfstream and FGT pipelines are interconnected in two places not far from Tampa, at Hardee and Osceola, with transfer capacities of 300,000 and 250,000 mmBtu/day, respectively. As mentioned previously, the Gulfstream firm transportation capacity is essentially fully subscribed. Only a small volume of firm transportation capacity is available in the winter months.[7] Since natural gas-fired combined-cycle generation requires firm transportation capacity on pipelines to support reliable full-load operation, particularly during peak periods, the Gulfstream pipeline is not adequate for future gas generation growth.

2.3 SABAL TRAIL TRANSMISSION PIPELINE

A planned pipeline will provide an estimated 1 billion cubic feet per year of natural gas capacity into Florida.[8] The project has been awarded to Sabal Trail Transmission, LLC, a joint venture between Spectra Energy and

[7] Florida Reliability Coordinating Council, *FRCC 2013 Load & Resource Reliability Assessment Report*, July 9, 2013.
[8] Spectra Energy Website: http://www.spectraenergy.com/

NextEra Energy, Inc. Additional natural gas capacity is very important to Florida because the existing pipelines are approaching full capacity and the future demand of natural gas is expected to increase at a steady rate.

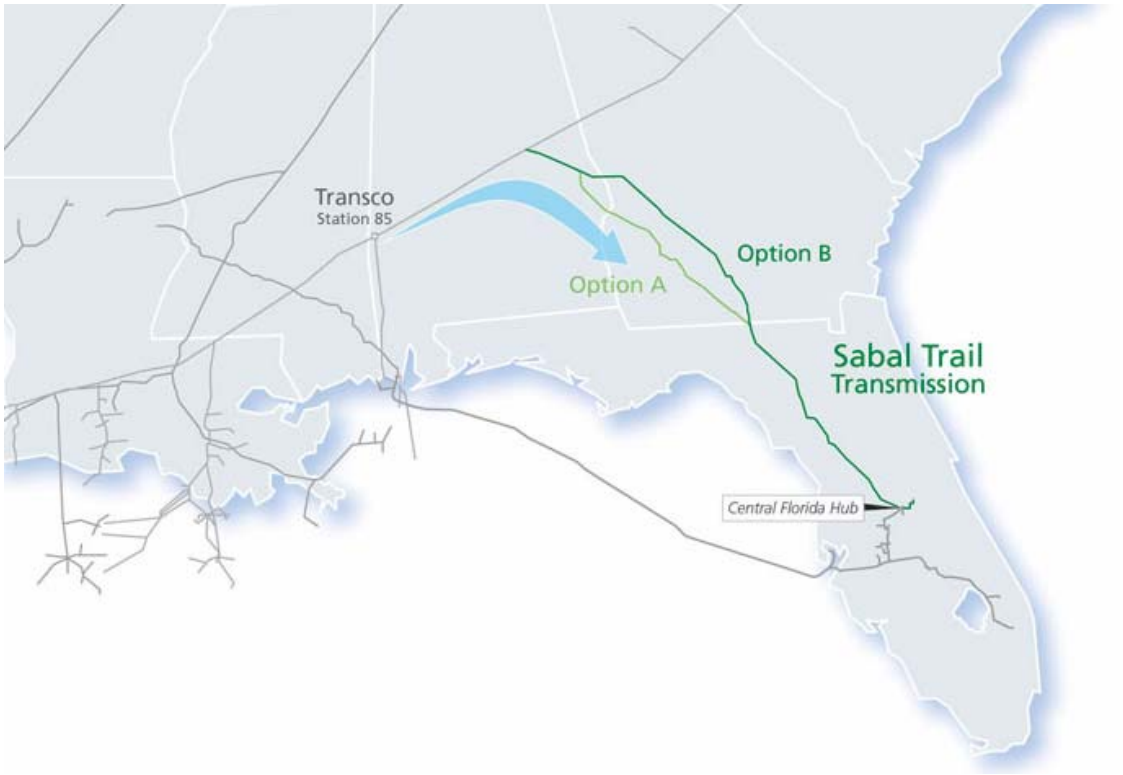
The proposed pipeline, called the Sabal Trail Transmission Pipeline, will extend between southwest Alabama and Martin County, Florida (see Figure 2-4). This project will increase reliability, diversity, and firm capacity throughout Florida by introducing a new supply source and by interconnecting with the other two main pipelines, FGT and Gulfstream.

The proposed project is part of two stages. The first stage consists of a stretch of approximately 465 miles of 36-inch diameter pipe from Alabama to a hub in central Florida. The second stage consists of installing approximately 126 miles of pipe from the central hub to a Florida Power and Light (FPL) plant in Martin County.[9]

The project is currently working through an extensive permitting process required on multiple levels, including the federal, state, and local, and is scheduled to begin construction in 2016 with project completion scheduled in May 2017.

[9] WGCU Southwest Florida News: http://news.wgcu.org/post/fpl-seeks-approval-600-miles-natural-gas-pipeline

Figure 2-4 — Sabal Trail Transmission Pipeline



Source: http://www.spectraenergy.com

2.4 CONCLUSIONS

One of the key findings in the FRCC 2013 Load & Resource Reliability Assessment Report issued July 9, 2013, was the following statement: "The natural gas pipeline capability is currently adequate; however, with limited infrastructure diversity and high dependence, adequacy could be impacted by the potential that future demand growth could exceed capacities or in the event of longer term pipeline outages or failures." The report further noted, "The FRCC, through its Fuel Reliability Working Group (FRWG), provides the administrative oversight of a Regional fuel reliability forum that assesses the interdependencies of fuel availability and electric reliability. Results of the most recent gas study indicated minimal risk to the reliability of the power system within the FRCC Region related to projected shorter term gas delivery disruptions." The report also stated, "As to future requirements, these existing natural gas pipelines into Florida are almost fully subscribed, though Florida's natural gas needs are expected to remain high in the coming years. To meet the high demand, the gas transportation infrastructure serving the state will also need to expand."

Last page of Section 2.

3. NATURAL GAS CURTAILMENTS AFFECTING FLORIDA

Several sources were reviewed to locate and identify gas supply disruptions in the southeastern states that may have affected the FRCC region. The sources reviewed to obtain this information are listed below.

- National Energy Technology Laboratory Electric Disturbance Events (OE-417) Annual Summaries
- NERC 2013 Special Reliability Assessment, dated May 2013
- NERC 2012 Long-Term Reliability Assessment, dated November 2012
- Posted Critical Notices on Gulfstream Natural Gas System website
- Posted Critical Notices on Florida Gas Transmission Pipeline website
- Personal interviews with personnel at Gulfstream Natural Gas System and Florida Gas Transmission Pipeline.

Natural gas supply curtailments documented within the NERC Special Reliability Assessment have been caused by various factors. Most recently in February of 2011, sustained freezing temperatures in southern Texas caused the moisture in the natural gas at the wellheads to freeze, blocking flow through pipelines. Icy roads prevented maintenance personnel from reaching the well heads to maintain them, and electrical blackouts during this period caused service interruptions in the natural gas compressor stations. The total curtailment impact of this event was 14.8 billion cubic feet over the course of five days primarily affecting the Transwestern Pipeline and El Paso Pipeline companies that supply natural gas to the southwestern United States.[10] Even though this event did not cause curtailment in Florida, the cold weather that occurred in Texas could just have easily affected the supply trunk lines into the Florida market.

Texas has had other cold-weather related production disruptions or curtailments before the 2011 event. NERC indicates that cold weather events in 1983, 1989, 2003, 2006, 2008, and 2010 created disruptions in natural gas production, and the 2003 event caused curtailments. The 2003 event occurred in Texas when 5,500 MW of capacity was lost due to gas curtailments for 2–3 days. An estimated 3,200 MW was regained on back-up fuel oil. There have been seven reported cold weather events over a 28-year span between 1983 and 2011 in Texas, all of which affected natural gas supplies to some extent, with two events causing curtailments. These indicate that although infrequent, the events and consequences do occur.

[10] North American Electric Reliability Corporation, "Outages and Curtailments During the Southwest Cold Weather Event of February 1-5, 2011," dated August 2011

Hurricanes are another frequent cause of natural gas supply disruptions. In a 13-year period, 1992 to 2010, a reported 21 hurricanes or tropical storms hit the Gulf Coast region and caused natural gas supply disruptions to some extent. The magnitude of the natural gas supply disruption over the 13-year time period as reported in the NERC Special Reliability Assessment report is shown in Table 3-1.

The Electric Disturbance Event (OE-417) Annual Summaries for years 2000 through 2013 reported by National Energy Technology Laboratory (NETL) were reviewed for disturbances in the FRCC region attributable to supply disruptions. Several reported incidents from Hurricane Katrina and Hurricane Rita in 2005 disrupted natural gas supplies or allotments, but the magnitudes of the disruptions were not reported.

Table 3-1 — Significant Gulf Coast Storms and Lost Gas Production

Year	Storms in Gulf	Category 3+ Storms in Gulf	Description	Estimated Gulf Gas Production Lost (Bcf)
1992	1	1	Andrew hit S. FL as a Cat 5 and LA as a Cat 3	N/A
1995	2	1	Erin hit E. FL as a Cat 1, crossed into gulf and hit FL panhandle as a Cat 2; Opal landed as a Cat 3 on FL panhandle	19
1997	1	0	Danny came across central gulf and LA tip and landed in Mobile Bay as Cat 1	
1998	1	0	Georges hit Cuba but was down to a Cat 1 when it hit MS	
1999	1	1	Bret hit S. TX as a Cat 3, Irene hit S. FL as a Cat 1	
2002	2	0	Isidore and Lili both Cat 1	76
2003	2	0	Tropical Storm Bill, Claudette Cat 1, and Erika	8
2004	2	2	Charlie Cat 4 hit SW FL and Ivan Cat 3 hit AL/FL border	196
2005	5	3	Cindy Cat 1 hit LA, Dennis Cat 3 hit FL panhandle, Katrina Cat 3 hit LA, and Rita Cat 3 hit TX/LA border	899
2007	0	0	Dean and Felix hit southern Mexico	
2008	3	2	Dolly in late July, Gustav Cat 2 in late August, and Ike Cat 2 in early September	441
2009	1	0	Ida in early November	
2010	0	0	Alex crossed Mexico in June	

Source: NERC 2013 Special Reliability Assessment, May 2013, pg. 31

According to Spectra Energy, shale gas production is expected to grow significantly and conventional gas production is expected to slow.[11] On the national scale, Sargent & Lundy expects that future supply disruptions due to hurricanes to have less impact because much of the new production of natural gas supply is

[11] Source: http://www.spectraenergy.com

being obtained from inland shale deposits, which reduces the percentage of natural gas supply from hurricane prone areas.

3.1 FLORIDA GAS TRANSMISSION SYSTEM CURTAILMENT

Another documented cause of curtailment in the NERC Special Reliability Assessment report was a lightning strike in 1998 to the Perry Compressor Station in the Florida Gas Transmission System that melted all three of the main lines at that location. This event resulted in a reported 1.5 billion cubic feet per day curtailment, but electrical blackouts were avoided through demand-side management by requesting voluntary reduction in electrical consumption. Home air-conditioner consumption of electricity was reduced, and utilities switched from gas to residual fuel oil. Partial service to the natural gas lines resumed in approximately 3 days.[12]

A force majeure critical notice posted to Florida Gas Transmission website occurred on August 15, 2012, when a large sinkhole developed in Assumption Parish, Louisiana, which was in close proximity to pipeline facilities. The sinkhole caused family evacuations and created dangerous conditions that forced Florida Gas Transmission Company to shut down receipt of the natural gas production in the vicinity of the sinkhole. Curtailment of natural gas supply is not documented.

Florida Gas Transmission Company has over 70 receipt locations. Most of the system has multiple pipes laid in parallel. Pipe looping, storage facilities, and range of receipt locations help to mitigate supply disruptions and maintain system reliability.

3.2 GULFSTREAM NATURAL GAS SYSTEM CURTAILMENT

Critical notices that are posted on Gulfstream Natural Gas System contain alerts directed towards the off-takers of current line pack levels, gas processing plant disruptions, planned system maintenance, etc. that could affect deliveries to certain areas. However the actual gas disruption associated with each of the posted critical notices is not provided. Through personal correspondence with various personnel working in the industry, we understand that the critical notices posted on the website typically provide sufficient advance notice for the bulk system to compensate for regional supply disruptions, and delivery curtailments therefore do not result. S&L contacted Williams Partners L.P., part owner of the Gulfstream Pipeline,[13] and found that Gulf Stream has not

[12] Natural Gas Security Issues Related to Electric Power Systems Presentation by Argonne National Laboratory, dated November 28, 2001.
[13] Phone Call to Williams Employee, Eric Raymond on August 15, 2013.

had any curtailments in the supply of natural gas since its construction in 2002. Redundancies built into the Gulfstream Pipeline system infrastructure, such as pipe looping, interconnections with other pipelines, and storage facilities, have been used to avoid extended supply disruptions and curtailments.

3.3 EXPECTED FUTURE RATE OF CURTAILMENTS

FRCC has developed an electrical generation shortage plan (FRCC Generating Capacity Shortage Plan), which documents procedures to be used by Florida's electric utilities and governmental agencies for response to an energy emergency to increase region-wide reliability. In this plan, utilities are required to have an individual energy emergency plan that will provide additional generating capability in the event there is an energy shortage on its system and the state-wide power system.

According to the plan, when a utility in the FRCC region has inadequate generating capability, including purchased power to supply its firm load, or when fuel supplies state-wide have decreased to a level where continuous uninterruptible service is not possible, a "Generating Capacity Emergency" is declared. Proper coordination between all utilities and the government and following the outlined plan increases the reliability of the bulk power system in FRCC region during an energy emergency.

The two main pipelines in FRCC frequently post notices to their website which inform off-takers of the pipelines current "line pack." Line pack is a term used to define natural gas that occupies all pressurized sections of the pipeline network.[14] When a new supply point is added to the system, the pressure in the line is increased or increases the line pack; whereas a new delivery point decreases the pressure in the system or lowers the line pack. When line pack is low, the major pipelines post notices to the off takers indicating such line pack levels; the notice also reminds the off takers to monitor their scheduled delivery during the notice to ensure the actual delivery does not exceed the scheduled delivery. While the natural gas pipelines to the national bulk power system have been reliable in the past, future reliability may or may not reflect past observations. The FRCC region currently receives 100% of the total supply of natural gas from two pipelines. The Florida Gas Transmission Pipeline, which provides approximately 62% of Florida's total supply, has multiple redundancies built into its system. However, if similar instances experienced in the past occur near the future generation's supply off-take, curtailments could be significant. Disregarding the sinkhole incident in 2012, which has been ongoing for over a year, the longest duration of curtailment in the Southern United

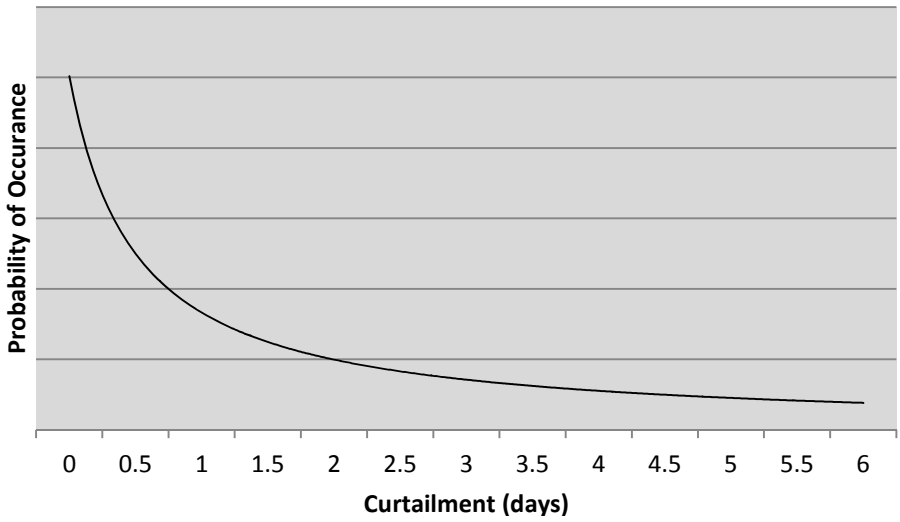
[14] Northwest Gas Association Natural Gas Term of the Week on January 1, 1970.

States occurred during the lightning strike to the Perry Compressor Station, which lasted approximately 5 days.

The historical curtailment events mentioned earlier are representative of the supply disruption on the pipeline, which may or may not have the same curtailment effect for a specific off-taker. The Perry Compressor Station lightning event previously mentioned occurred in 1998, approximately 15 years ago, suggesting that the probability of occurrence is unlikely. From the number of notices that have been sent out by both major pipelines, it is reasonable to assume the potential natural gas curtailments due to low line pack levels are more likely to occur, but the magnitude of the curtailment would be much less.

Sufficient data were not available to determine the explicit probability of curtailment for a specific plant. However, a representative probability of natural gas curtailment shown in Figure 3-1 indicates low probability of occurrence for long duration events and higher probability of occurrence for short duration events.

Figure 3-1 — Representative Relationship of Natural Gas Curtailment Probability of Occurrence and Duration



Last page of Section 3.

4. ENVIRONMENTAL CONSIDERATIONS FOR DUAL FUEL OPERATION

S&L reviewed permits issued for combined-cycle combustion turbines in Florida to identify air pollution control technologies that will likely be required for new combined-cycle combustion turbines. Recently permitted single and dual fuel-fired combined-cycle combustion turbines facility projects were permitted with similar combustion control and post-combustion control emissions technologies. Plants that use fuel oil may have a more challenging time demonstrating NO_X and SO_2 compliance, especially during start-up, and obtaining air quality permits will likely be more difficult due to NAAQS compliance challenges. The fundamental permitting considerations impacted by fuel choice are summarized in this section.

4.1 AIR PERMITTING REQUIREMENTS

The construction and operation of a new entrant electric power generating facility in the state of Florida is subject to comprehensive environmental review. Any new fossil fuel-based power generating facility that may emit air contaminants will require a permit to construct from the Florida Department of Environmental Protection (DEP). In addition to permitting requirements, all new stationary combustion sources are subject to specific air quality regulations limiting emissions from the source. Applicability of the air quality regulations is a function of the source type and size, fuel-fired, potential emissions, and location of the proposed new source.

Potential air quality standards applicable to new combined cycle combustion turbine facilities include:

- New Source Performance Standards (NSPS) (40 CFR Part 60)
- National Emission Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 63)
- Florida State Stationary Source Emissions Standards (Rule 62-296, FAC)
- New Source Review (NSR) (40 CFR 52.21)

Florida standards address emissions from petroleum liquid storage tanks.

New units subject to NSR will be required to install air pollution controls and meet unit-specific emission limits established during the NSR review process. There are two types of NSR permitting requirements for new major sources: (1) Prevention of Significant Deterioration (PSD) permits, which are required for a new major source located in an attainment area; and (2) Non-attainment NSR (NNSR) permits, which are required for a new major source located in a non-attainment area. The PSD and NNSR permit requirements apply to proposed new major

sources of regulated NSR/PSD air pollutants.[15] A new fossil fuel-fired steam electric plants of more than 250 mmBtu/hr heat input is deemed a "major stationary source," as defined in Rule 62-210.200(194), when the facility emits, or has the potential to emit, 100 tons per year or more of any PSD pollutant, taking into consideration fugitive emissions. The major source thresholds may be reduced if the source is located in an area that does not meet the National Ambient Air Quality Standards (NAAQS) (i.e., non-attainment areas). According to Rule 62-204.340, FAC, all of the state of Florida is designated as attainment, unclassifiable, or maintenance for ozone, PM_{10}, SO_2, CO, NO_2, and lead. The U.S. EPA designates a portion of Hillsborough County as a non-attainment area for the 2008 Lead NAAQS, but new combined-cycle combustion turbines facilities will likely not emit a significant amount of lead emissions.

PSD regulations require the applicant to do the following:

- Obtain a permit before beginning construction of the new source.
- Prepare an ambient air quality impact analysis to determine whether emissions from the proposed project will cause or contribute to a violation of the applicable NAAQS or PSD increments.
- Conduct a Best Available Control Technology (BACT) review and install emission control technologies that represent BACT.
- Provide an additional impact analysis, which includes an analysis of the potential impairment to visibility, soils, and vegetation as a result of the proposed new facility, as well as the potential general commercial, residential, industrial, and other growth associated with the proposed new facility.

4.2 AMBIENT AIR QUALITY ANALYSIS

An ambient air quality impact analysis would need to be conducted for each regulated air pollutant for which the facility exceeds the significant emissions threshold to determine whether emissions from the proposed project will cause or contribute to a violation of the applicable NAAQS or PSD increments.

Potentially applicable NAAQS include the recently updated 1-hour NO_2 and SO_2 NAAQS, 100 ppb and 75 ppb, respectively. New single and dual fuel-fired combined-cycle combustion turbine facilities, regardless of fuel use, may be required to conduct ambient air quality impact analyses that include demonstrating compliance with these new 1-hour standards. Although both types of facilities may be able to demonstrate compliance with these standards, facilities firing diesel fuel oil may have a more challenging time demonstrating compliance,

[15] Regulated NSR air pollutants include carbon monoxide (CO), lead (Pb), nitrogen oxides (NOx), sulfur dioxide (SO_2), volatile organic

especially during start-up, since NO_X and SO_2 emissions from firing diesel fuel oil tend to be higher than emissions from firing natural gas. However, there are many variables that are considered during the air quality impact modeling process, and analyses must be conducted on a case-by-case basis. In the case of dual fuel capability, obtaining an air quality permit will likely be more difficult due to the expected NAAQS compliance challenges.

4.3 BACT REQUIREMENTS

BACT is defined as an emission limitation based on the maximum degree of reduction of each air pollutant emitted from a stationary air emissions source that the Florida DEP determines is achievable for such source on a case-by-case basis.

S&L conducted a review of the U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC) Database and a review of permits issued for combined-cycle combustion turbines in Florida to identify air pollution control technologies that will likely be deemed BACT for new combined-cycle combustion turbines. It should be noted that BACT requirements are continuously changing and will tend to be increasingly stringent in the future.

Recently permitted single and dual fuel-fired combined-cycle combustion turbines facility projects were permitted with similar combustion control and post-combustion control emissions technologies. For NO_X control, combined-cycle combustion turbine facilities were permitted with combustion control technologies, particularly dry low-NO_X systems to be used when firing natural gas and water injection systems when firing fuel oil (either ultra-low sulfur diesel (ULSD) or No. 2 distillate oil (DO)), and post-combustion controls, specifically selective catalytic reduction (SCR) systems, to be used when firing natural gas and fuel oil.

Table B-1 in Appendix B, provides a summary of recently issued NSR/PSD air construction permits for combined-cycle facilities in Florida, including authorized fuel use and restrictions. Between 2002 and October 2012, there were 15 facilities in Florida that received NSR/PSD Air Construction Permits for combined-cycle facilities. Twelve of the facilities that received NSR/PSD permits have combustion turbines with dual fuel capabilities. Eight of these plants are in central Florida (Pinellas, Manatee, Polk, Osceola, Orange, and Brevard counties), of which two and part of a third are gas only. Four are on the southeastern coast (St. Lucie, Martin, Palm Beach, and Dade counties), and all have ULSD backup.

compounds (VOC), and particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}).

The data in Table B-1 show that the 15 combined-cycle faculties have comparable emissions controls technologies. Some variations between permits, relevant to this study, included authorized fuel type (e.g., natural gas only, dual-fuel using ULSD or No. 2 DO), authorized fuel oil type (e.g., ULSD 0.0015% sulfur by weight, No. 2 DO 0.05% sulfur by weight), and annual hours of operation restrictions for firing fuel oil (ranging from 500 hours to 1,000 hours per combustion turbine). Further evaluation of the facilities' Technical Evaluations would be required to evaluate each permit applicant's rationale regarding each BACT determination in order to further analyze the variations between permits.

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5. OPERATIONAL AND RELIABILITY CONSIDERATIONS

5.1 OPERATIONAL CONSIDERATIONS FOR FUEL OIL UTILIZATION

For continuous plant operations to occur on dual fuel without backup distillate fuel storage on-site, daily deliveries of about 152 trucks (unloading at approximately 9.5 minutes per truck) or 56 rail cars (unloading at approximately 26 minutes per rail-car) are required. After considering factors such as the unloading time and frequency of needed deliveries, and unreliable traffic and road/rail conditions, it is apparent that plant operation from continuous fuel shipment is impractical. The size of the backup fuel tank then becomes a tradeoff between the need to turn over inventory and the likelihood of needing the entire inventory to keep the plant running during a curtailment. A more likely scenario for distillate fuel supply in the central Florida region is either long-term on-site storage, which requires significant capital investment in land and equipment, or short-term on-site storage while connecting to an available distillate fuel supply pipeline in the area.

As a conservative measure, this study considers that the Citrus County combined-cycle facility would plan for long-term on-site storage of about three full power days of fuel supply as a contingency against gas supply interruptions, which is equivalent to about 6 million gallons. Annual testing is estimated to be about 15 full power hours per year, meaning that the average turnover period of this fuel just from testing would be about five years. Normally, the life of diesel fuel is considerably shorter than five years; for example, NFPA 110 refers to the storage life of diesel fuel as 18 months to two years.

Maintaining fuel quality at such a low rate of turnover would require a fuel management program to deal with degradation of the fuel over time from such causes as repolymerization, organic growth (bacteria, algae, and fungi), and oxidation. Additives can be used to control such degradation. Control of moisture in storage tanks can reduce degradation problems. A testing program should be instituted to monitor fuel quality and stability. Depending on experience with fuel stability and degradation, it might be necessary to turn the fuel over at a higher rate than just needed for testing. The economic analysis in Section 5 of this report does not include oil consumption beyond the assumed 15 hour per year engine testing program, nor are costs of oil testing and stabilization included in that analysis.

5.2 BACKUP FUEL CAPABILITY OF EXISTING COMBINED-CYCLE PLANTS IN FRCC

To assess the prevalence of backup fuel capability in combined cycle plants in FRCC, we extracted from the Ventyx Velocity database a list of all combined-cycle plants in FRCC having generating capacity 200 MW or more that are operating or planned. We checked the primary and backup fuel capabilities of those units against tables in "FRCC 2013 Regional Load & Resource Plan," published July 2013. Forty combined-cycle plants were identified, of which 23 (58%) have natural gas as primary fuel and diesel or distillate fuel oil as backup fuel, and 17 (43%) have natural gas as primary fuel but no backup fuel is identified in the FRCC document. Considered on a megawatt basis, about half the capacity has backup fuel capability and half does not.

Most of Duke Energy's plants (shown as Progress Energy Florida in the figures) have backup fuel capability. Each individual plant's incremental impact on system reliability is likely small because the backup capability of the existing fleet as a whole provides significant reliability for the electrical system. The utilities in Florida also have the ability to use alternate backup fuels at numerous dual-fuel simple-cycle CT and steam generating stations to support overall system reliability if gas availability is curtailed for some reason.

Plants in the FRCC region that have backup fuel capability are listed in the following table.

Table 5-1 — Combined-Cycle Units in FRCC Exceeding 200 MW with Backup Fuel Capability

plant	owner	MW	startup	primary fuel	backup fuel
Treasure Coast Energy Center	Florida Municipal Power Agency	411	5/31/2008	Gas	DFO
Cape Canaveral	Florida Power & Light Co	1,219	4/24/2013	Gas	DFO
Lauderdale	Florida Power & Light Co	521	5/1/1993	Gas	DFO
Lauderdale	Florida Power & Light Co	521	6/1/1993	Gas	DFO
Martin (FL)	Florida Power & Light Co	612	2/1/1994	Gas	DFO
Martin (FL)	Florida Power & Light Co	612	4/1/1994	Gas	DFO
Port Everglades	Florida Power & Light Co	1,277	6/30/2016	Gas	DFO
Putnam (FL)	Florida Power & Light Co	290	8/1/1977	Gas	DFO
Putnam (FL)	Florida Power & Light Co	290	4/1/1978	Gas	DFO
Riviera	Florida Power & Light Co	1,219	6/1/2014	Gas	DFO
West County Energy Center	Florida Power & Light Co	1,421	7/27/2011	Gas	DFO
Hardee Power Station	Hardee Power Partners Ltd	287	7/1/1992	Gas	DFO
Brandy Branch	JEA	598	3/31/2005	Gas	DFO
Hines Energy Complex	Progress Energy Florida	547	4/1/1999	Gas	DFO
Hines Energy Complex	Progress Energy Florida	516	12/9/2003	Gas	DFO
Hines Energy Complex	Progress Energy Florida	590	11/7/2005	Gas	DFO
Hines Energy Complex	Progress Energy Florida	610	12/31/2007	Gas	DFO
P L Bartow	Progress Energy Florida	1,253	6/26/2009	Gas	DFO
Richard J Midulla Generating Stn	Seminole Electric Coop Inc	587	1/1/2002	Gas	DFO
Stanton Energy Center	Southern Co Florida LLC	447	10/1/2003	Gas	DFO
Stanton Energy Center	Southern Power Co	216	12/31/2009	Gas	DFO
Arvah B Hopkins	Tallahassee FL (City of)	447	7/1/2008	Gas	DFO
S O Purdom	Tallahassee FL (City of)	247	7/1/2000	Gas	DFO
total with backup fuel (23 plants)		14,739			

Plants in the FRCC region that do not have backup fuel capability are as follows:

Table 5-2 — Combined-Cycle Units in FRCC Exceeding 200 MW without Backup Fuel Capability

plant	owner	MW	startup	primary fuel	backup fuel
Osprey Energy Center	Calpine Constr. Finance Co LP	644	5/27/2004	Gas	None
Cane Island	Florida Municipal Power Agency	324	7/12/2011	Gas	None
Fort Myers	Florida Power & Light Co	1,722	5/30/2002	Gas	None
Manatee (FPL)	Florida Power & Light Co	1,225	6/30/2005	Gas	None
Martin (FL)	Florida Power & Light Co	1,225	6/30/2005	Gas	None
Sanford (FL)	Florida Power & Light Co	1,360	6/14/2002	Gas	None
Sanford (FL)	Florida Power & Light Co	1,360	4/1/2003	Gas	None
Turkey Point	Florida Power & Light Co	1,224	5/1/2007	Gas	None
West County Energy Center	Florida Power & Light Co	1,421	10/27/2009	Gas	None
West County Energy Center	Florida Power & Light Co	1,421	11/3/2009	Gas	None
Lansing Smith	Gulf Power Co	620	4/22/2002	Gas	None
C D McIntosh Jr	Lakeland Dept of Electric Water Utils	369	4/4/2002	Gas	None
Tiger Bay	Progress Energy Florida	278	8/1/1997	Gas	None
Santa Rosa Energy Center	Santa Rosa Energy Center LLC	275	6/6/2003	Gas	None
Bayside Power Station	Tampa Electric Co	809	4/1/2003	Gas	None
Bayside Power Station	Tampa Electric Co	1,205	1/15/2004	Gas	None
Polk Station	Tampa Electric Co	580	1/1/2017	Gas	None
total without backup fuel (17 plants)		16,060			

Last page of Section 5.

6. COST OF PROVIDING BACKUP FUEL CAPABILITY

Sargent & Lundy developed estimates of the costs of providing backup fuel capability. Costs are measured by the capital investment costs required for dual-fuel operation, fuel oil testing at commissioning, fuel oil inventory costs, annual fuel oil testing, and fuel oil consumption during curtailments. O&M costs during fuel oil operation are not estimated because the incremental cost above natural gas operation is negligible. The avoided costs of natural gas supply curtailments over the operating life of the plant are based on the equivalent cost of wholesale power purchases during the curtailments. Avoided costs of natural gas consumption during curtailments are not included since they are the same whether or not backup fuel capability is provided. The derivation of the cost components are described in the following subsections.

6.1 CAPITAL INVESTMENT FOR DUAL FUEL OPERATION

Dual-fuel operation requires additional piping, storage tanks, and related facilities. Fuel oil tanks were sized on the basis of three days of full-load backup ULSD inventory, which is equivalent to approximately 6,000,000 gallons. Sargent & Lundy estimated the total cost of these facilities to be $28,310,000 (in 2013 $) which includes $24,052,000 in direct costs, $1,684,000 in owner's costs, and $2,574,000 in financing costs during construction. The detailed cost estimate is provided in Table 6-1 below. Capital investment costs are assumed to escalate by 2.5% per year between 2013 and the 2017 commercial operation date (COD). Financing costs during construction are not included in this estimate.

Table 6-1 — Conceptual Cost Estimate for Fuel Oil Operation

Acct No.	Item Description	Total Projected Cost	
10.00	**General Site Work**	**$**	**193,857**
10.10	Civil Site Work	$	147,163
10.90	Construction Indirects	$	46,694
11.00	**Underground**	**$**	**354,639**
11.10	Civil Undergroud Works	$	267,142
11.90	Construction Indirects	$	87,497
21.00	**Combustion Turbine**	**$**	**9,836,205**
21.20	Concrete Works	$	9,920
21.50	Electrical	$	78,360
21.60	Mechanical - Combustion Turbines	$	8,856,793
21.70	Piping	$	785,358
21.90	Construction Indirects	$	105,774
55.00	**Water Treatment**	**$**	**2,072,599**
55.20	Concrete Works	$	436,263
55.60	Mechanical	$	180,514
55.90	Construction Indirects	$	135,822
55.99	Subcontract - Demineralized Storage Tank	$	1,320,000
70.00	**Electrical Power Distribution**	**$**	**145,726**
70.50	Electrical	$	121,793
70.90	Construction Indirects	$	23,933
75.00	**Distributed Control System**	**$**	**380,462**
75.55	Instrumentation	$	347,981
75.90	Construction Indirects	$	32,481
80.00	**Balance of Plant Works**	**$**	**7,931,133**
80.20	Concrete Works	$	2,725,397
80.45	Painting & Coating	$	76,419
80.60	Mechanical - Fuel Oil Forwarding Pumps	$	262,862
80.70	BOP Piping	$	438,107
80.80	Insulation	$	85,337
80.90	Construction Indirects	$	1,050,811
80.99	Subcontract - Fuel Oil Storage Tank	$	3,292,200
OP.00	**Subtotal - Project Costs**	**$**	**20,914,621**
	Project Contingency at 15%	$	3,137,193
	Subtotal - Overall Project Costs	**$**	**24,051,814**
	Owner's Costs	$	1,684,000
	Financing Costs during Construction		Not Included
PI.00	**Total - Overall Project Costs**	**$**	**25,735,814**

6.2 FUEL OIL TESTING AT COMMISSIONING

Approximately 30 hours of the plant commissioning period must include fuel oil testing. The cost of testing is measured as an incremental cost of fuel at full load over this period compared to gas firing. Based on the forecasted cost of $23.33/mmBtu for ULSD and $5.72/mmBtu for natural gas at the 2017 COD, along with the previously indicated values for plant output and heat rate, the fuel oil testing cost at commissioning is $6,060,000 (in 2017 $).

6.3 FUEL OIL INVENTORY COSTS

Maintaining on-site inventory of fuel oil results in the incurrence of substantial inventory carrying charges. For example, Duke would experience inventory carrying charges of nearly $3 million per year for an on-site inventory of 6 million gallons of ULSD at the Citrus County site.

On the basis of a three-day full-load inventory of ULSD, a heating value of 138,876 Btu/gallon, a fuel price of $23.33/mmBtu at the COD, and the previously indicated values for plant output and heat rate, the fuel oil inventory cost is $19,265,000. The economic analysis provides a credit for the fuel oil inventory at the end of the evaluation period.

6.4 ANNUAL FUEL OIL TESTING

Over the plant operating life, approximately 15 hours per year must include fuel oil testing. The cost of testing is measured as an incremental cost of fuel at full load over this period compared to gas firing. Based on the forecasted cost of $24.68/mmBtu for ULSD and $5.96/mmBtu for natural gas during the first year of operation, along with the previously indicated values for plant output and heat rate, the fuel oil testing cost during the first year of operation is $3,134,000 per year.

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Appendix A

Permitting Summary for Combined Cycle Facilities in Florida

Table A-1 — Summary of Recently Issued NSR/PSD Air Construction Permits for Combined-Cycle Facilities in Florida State

Facility	Cane Island Power Park	FPL Cape Canaveral Energy Center	FPL Manatee Power Plant	FPL Martin Power Plant	FPL Turkey Point Fossil Plant	FPL West County Energy Center	Hines Energy Complex	Hines Energy Complex	Hines Energy Complex	H.L. Culbreath Bayside Power Station	H.L. Culbreath Bayside Power Station	Stanton Energy Center	TEC Polk Power Station	Treasure Coast Energy Center	PEF Bartow Power Plant
Project	Unit 4	Unit 3	Unit 3	Unit 8	Unit 5	Unit 3	PB 2	PB 3	PB 4	Units 1 and 2	Units 3 and 4	Unit B	Polk 2	Unit 1	Repowering
Location	Osceola County	Brevard County	Manatee County	Martin County	Miami-Dade County	Loxahatchee	Polk County	Polk County	Polk County	Brevard County	Brevard County	Orange County	Polk County	St. Lucie County	Pinellas County
Permit No.	PSD-FL-400	0090006-005-AC	PSD-FL-328	PSD-FL-327E	PSD-FL-338	PSD-FL-396	PSD-FL-296A	PSD-FL-330	PSD-FL-342	PSD-FL-301C	PSD-FL-301C	PSD-FL-373A	PSD-FL-421	PSD-FL-353	PSD-FL-381
Permit Application Date	3/27/2008	12/29/2008	2002	7/2011	1/4/2003	11/20/2007	2003	2003	2003	2004	2004	2/2008	10/2012	4/14/2005	7/28/2006
Air Construction Permit Date (Final/Draft)	9/5/2008 (Final)	7/23/2009 (Final)		2012 (Draft)	2/8/2005 (Final)	7/30/2008 (Final)	(Final)	(Final)	(Final)	(Final)	(Final)	5/4/2008 (Final)	2013 (Draft)	5/19/2006 (Final)	(Final)
Commercial Operation Date	2/7/2011	12/2010	5/23/2005	2001 & 2004	12/2006	12/2010	8/2003	8/2005	9/2007	2003	2009	11/27/2009	8/4/1996	2/12/2008	12/2008
BACT Analysis	CO NOx PM/PM10 SAM SO2	N/A	CO NOx PM/PM10 SAM VOC SO2	N/A	CO NOx PM/PM10 SAM SO2 VOC	CO NOx PM/PM10 SAM SO2 VOC	CO NOx PM/PM10 SAM VOC SO2	CO NOx PM/PM10 SAM VOC SO2	CO NOx PM/PM10 SAM SO2	CO PM/PM10 VOC	CO PM/PM10 VOC	CO NOx PM/PM10/PM2.5 SAM SO2	CO NOx PM/PM10/PM2.5 SAM VOC SO2	CO NOx PM/PM10 SAM SO2	CO VOC
Facility Characteristics:															
Project MW	300 MW	1,295 MW	1,150 MW	1,150 MW	1,150 MW	1,250 MW	530 MW	530 MW	530 MW	1,836 MW	1,009 MW	300 MW	1,160 MW	300 MW	1,280 MW
CTG(s) Dual Fuel Capabilities	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Fuel Type(s):	NG	NG / ULSD (restricted alternate)	NG	NG / ULSD (restricted alternate)	NG / ULSD (restricted alternate)	NG / ULSD (restricted alternate)	NG / No. 2 DO (restricted alternate)	NG / No. 2 DO (restricted alternate)	NG / No. 2 DO (restricted alternate)	NG	NG / No. 2 DO Unit 3 Only (restricted alternate)	NG / ULSD (restricted alternate)	NG / ULSD (restricted alternate)	NG / ULSD (restricted alternate)	NG / DO (restricted alternate)
CTG(s)	1 x 150 MW w/ DB/HRSG	3 x 265 MW w/ DB/HRSG	4 x 170 MW w/ DB/HRSG	4 x 170 MW w/ DB/HRSG	4 x 170 MW w/ DB/HRSG	3 x 250 MW w/ DB/HRSG	2 x 170 MW w/ HRSG	2 x 170 MW w/ HRSG	2 x 170 MW w/ HRSG	7 x 169 MW w/ HRSG	4 x 169 MW w/ HRSG	1 x 150 MW w/ DB/HRSG	3 x 165 MW w/ DB/HRSG	1 x 170 MW w/ DB/HRSG	4 x 215 MW w/ DB/HRSG
STG(s)	1 x 150 MW	1 x 500 MW	1 x 470 MW	1 x 500 MW	1 x 470 MW	1 x 500 MW	1 x 190 MW	1 x 190 MW	1 x 190 MW	6 x 125 MW (shared with Units 3 and 4)	6 x 125 MW (shared with Units 1 and 2)	1 x 150 MW	1 x 500 MW	1 x 130 MW	1 x 420 MW
Emissions Controls	Combustion controls for NOx; SCR for NG/FO	DLN for NG; WI for FO; SCR	DLN; SCR	DLN for NG; WI for FO; SCR for NG/FO	DLN for NG; WI for FO; SCR for NG/FO	DLN for NG; WI for FO; SCR for NG/FO	DLN for NG; WI for FO; SCR for NG/FO	DLN for NG; WI for FO; SCR for NG/FO	DLN for NG; WI for FO; SCR for NG/FO	DLN; SCR	DLN for NG; WI for FO; SCR for NG/FO	DLN for NG; WI for FO; SCR for NG/FO	DLN for NG; WI for FO; SCR for NG/FO	Combustion controls for NG; WI for FO; SCR for NG/FO	DLN for NG; WI for FO; SCR for NG/FO
FO-Fired SU/SD Gen(s)	1 x 750 kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1 x 1,525 kW	N/A
FO-Fired Emer. Gen(s)	N/A	2 x 2,250 kW	N/A	N/A	N/A	2 x 2,250 kW	N/A	N/A	N/A	N/A	N/A	N/A	2 x 500 kW	N/A	N/A
FO-Fired Emer. Fire Pump Engine(s)	1 x 300 hp	1 x 300-hp	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1 x 300 hp	1 x 300 hp

Facility	Cane Island Power Park	FPL Cape Canaveral Energy Center	FPL Manatee Power Plant	FPL Martin Power Plant	FPL Turkey Point Fossil Plant	FPL West County Energy Center	Hines Energy Complex	Hines Energy Complex	Hines Energy Complex	H.L. Culbreath Bayside Power Station	H.L. Culbreath Bayside Power Station	Stanton Energy Center	TEC Polk Power Station	Treasure Coast Energy Center	PEF Bartow Power Plant
Air Construction Permit															
Fuel Type(s):															
CTG(s)	NG only	NG / ULSD (restricted alternate)	NG only	NG / ULSD (restricted alternate)	NG / ULSD (restricted alternate)	NG / ULSD (restricted alternate)	NG / No. 2 DO (restricted alternate)	NG / No. 2 DO (restricted alternate)	NG / No. 2 DO (restricted alternate)	NG only	NG / No. 2 DO Unit 3 Only (restricted alternate)	NG / ULSD (restricted alternate)	NG / ULSD (restricted alternate)	NG / ULSD (restricted alternate)	NG / DO (restricted alternate)
HRSG w/ DB	NG only	NG only	NG only	TBD	NG only	NG only	N/A	N/A	N/A	N/A	N/A	NG only	NG only	NG only	NG only
NG Restrictions:															
CTG(s)															
Sulfur Content	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF
Annual HOP Limit	8,760	8,760	8,760	TBD	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
HRSG w/ DB															
Sulfur Content	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	TBD	2.0 gr/100 SCF	2.0 gr/100 SCF	N/A	N/A	N/A	N/A	N/A	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF	2.0 gr/100 SCF
Annual HOP Limit	8,760	8,760	8,760	TBD	8,760	8,760	N/A	N/A	N/A	N/A	N/A	8,760	Ave. 4,000 hrs per DB over the 4 CTGs	8,760	2,434 hrs per DB (9,736 hrs over the 4 DB)
FO Restrictions:															
Sulfur Content	N/A	0.0015% by wt	N/A	0.0015% by wt	0.0015% by wt	0.0015% by wt	0.05% by wt	0.05% by wt	0.05% by wt	N/A	0.05% by wt (Unit 3 only)	0.0015% by wt	0.0015% by wt	0.0015% by wt	0.05% by wt
Annual HOP Limit (Daily HOP Limit)	N/A	3,000 hrs aggregate over the 3 CTGs	N/A	TBD	500 hrs	500 hrs per CTG	19,703,000 gallons (~720 hrs)	19,703,000 gallons (~720 hrs)	30,700,000 gallons (~1,000 hrs)	N/A	If NG not available; If no FO used >875 full load hrs (Unit 3 only)	1,000 hrs	750 ave. hrs per CTG (48 hrs per day)	500 hrs	1,000 hrs per CTG (5,000 hrs over the 5 CTGs)
FO-Fired Auxiliary Equipment Restrictions:															
FO-Fired SU/SD Gen(s)															
Sulfur Content	0.0015% by wt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0015% by wt	N/A
Annual HOP Limit	As needed w/ 200 hrs non-emergency maintenance testing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	200 hrs	N/A
FO-Fired Emer. Gen(s)															
Sulfur Content	N/A	0.0015% by wt	N/A	N/A	N/A	0.0015% by wt	N/A	N/A	N/A	N/A	N/A	N/A	15 ppm	N/A	N/A
Annual HOP Limit	N/A	160 hours	N/A	N/A	N/A	160 hrs	N/A	N/A	N/A	N/A	N/A	N/A	100 hrs	N/A	N/A

Facility	Cane Island Power Park	FPL Cape Canaveral Energy Center	FPL Manatee Power Plant	FPL Martin Power Plant	FPL Turkey Point Fossil Plant	FPL West County Energy Center	Hines Energy Complex	Hines Energy Complex	Hines Energy Complex	H.L. Culbreath Bayside Power Station	H.L. Culbreath Bayside Power Station	Stanton Energy Center	TEC Polk Power Station	Treasure Coast Energy Center	PEF Bartow Power Plant
FO-Fired Emer. Fire Pump Engine(s)															
Sulfur Content	0.0015% by wt	0.0015% by wt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0015% by wt	0.05% by wt
Annual HOP Limit	Emergency conditions; 80 hrs non-emergency maintenance testing	Emergency conditions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	200 hrs	Emergency conditions; 40 hrs non-emergency maintenance testing

Note: Acronyms and abbreviations used in the table are as follows: CTG – Combustion Turbine Generator ; DB – Duct Burners; DLN – Dry Low NOx; DO – Distillate Oil; Emer. Gen – Emergency Generator; FL – Florida; FO – Fuel Oil; FPL – Florida Power and Light Company; gr/100 SCF - grains per 100 standard cubic feet; HOP – Hours of Operation; hp – Horsepower; hrs – Hours; HRSG – Heat Recovery Steam Generator; kW – Kilowatt; MW – Megawatts; N/A – Not Applicable; NG – Natural Gas; PEF - Progress Energy Florida; PSD – Prevention of Significant Deterioration; SCR – Selective Catalytic Reduction; STG – Steam Turbine Generator; SU/SD – Start-up/Shut-down; TBD – To Be Determined; TEC – Tampa Electric Company; ULSD – Ultra-low Sulfur Diesel; WI – Water Injection; wt – Weight

Last page of Appendix B.

Citrus County Combined Cycle Power Plant Estimate

Estimate Category	**$ Million (nominal)**
Major Equipment and Engineering, procurement and Construction (EpC)	$1,121
Owners Costs including Transmission and Contingency	$229
Subtotal Project Estimate	**$1,350**
AFUDC	$164
Total Project Cost	**$1,514**

Citrus County Combined Cycle Power Plant Projected Schedule/Key Milestones

Key Project Milestone	Date
File Need Petition	May 2014
File SCA	August 2014
Award/Release EPC Contract	October 2014
Need Order issued by FPSC	October 2014
Award/Release Major Equipment Contracts	November 2014
SCA Approval	October 2015
EPC Begin Construction	January 2016
Receive Major Equipment	November 2016
Mechanical Completion – First Fire Block 1	November 2017
COD Block 1	May 2018
Mechanical Completion – First Fire Block 2	May 2018
COD Block 2	December 2018