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**M E M O R A N D U M**

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**TO:** Brad Williams and David Sharp – Floridian Gas Storage  
**FROM:** Concentric Energy Advisors, Inc.  
**DATE:** September 26, 2008  
**RE:** Discussion Issues

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Pursuant to your request, Concentric Energy Advisors, Inc. (“Concentric”) has reviewed certain issues regarding the Floridian Natural Gas Storage (“FGS”) proposed project. For each of the issues reviewed, Concentric will provide a brief description of the issue and our analysis. However, prior to this analysis, Concentric will first provide an executive summary of our observations followed by an overview of the FGS project and finally a brief review of the Florida energy market.

**EXECUTIVE SUMMARY**

Florida faces even greater energy supply challenges than it has confronted in the past. These challenges stem from rapid growth in demand for electricity, surging energy supply costs, and recognition of the need to secure meaningful greenhouse gas (“GHG”) reductions. The Floridian Gas Storage project (“Floridian”) site in south Florida and its proposed interconnection to both of the primary interstate natural gas pipelines serving the state will allow Floridian to access virtually all of the state’s existing and proposed new natural gas-fired power plants.

Floridian’s strategic location offers Florida a new in-state natural gas supply resource with significant economic and environmental benefits. In addition, Floridian also provides a cost-effective in-state insurance policy to support critical energy security and system reliability objectives. By allowing consumers to convert underutilized off-peak pipeline capacity into high value peak hour deliverability, Floridian promotes efficiency and creates economic value for Florida while enhancing the state’s energy security. As stated by the Federal Energy Regulatory Commission (“FERC”) in the recent Order Issuing Certificate for Floridian,

“Pipeline system expansions, consisting of the construction of large-diameter pipelines, looping of constrained portions of the pipelines, or additional compression would not provide needed storage capacity nor satisfy the project objective of having supply available in Florida to serve the region during peak demand periods and weather related shut-ins when pipeline deliveries are curtailed or disrupted, and are not considered a viable alternative to the proposed project”.<sup>1</sup>

In summary, by adding a strategic reserve of natural gas located in south Florida, Floridian furthers state energy policy as expressed in the 2008 Florida Energy Legislation signed by Governor Crist:

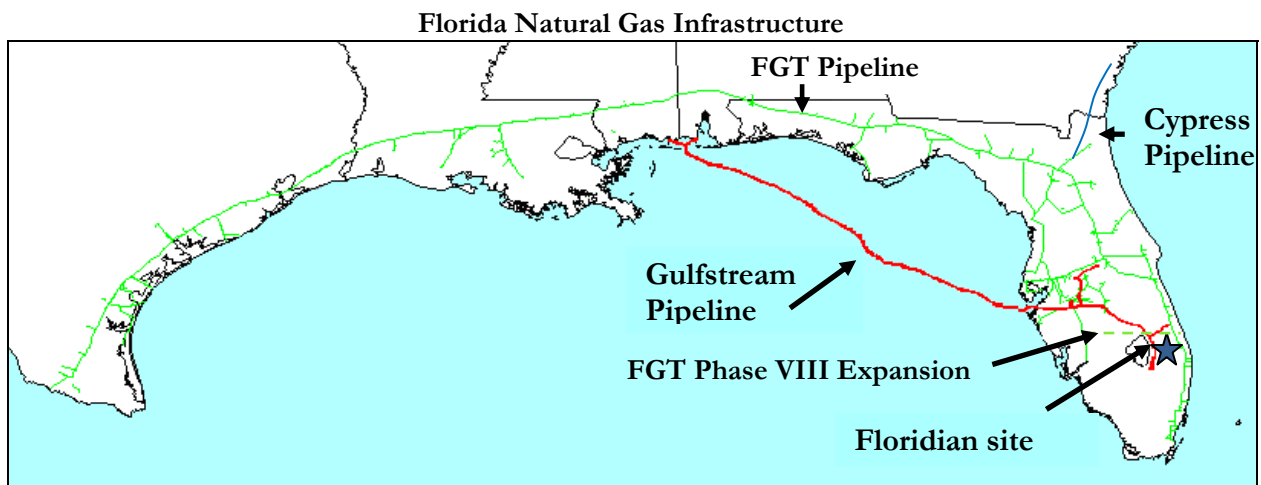
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<sup>1</sup> *Floridian Natural Gas Storage Company, LLC*, 24 FERC ¶ 61,214 (2008) at Mimeo p. 36.

Further, the Legislature finds that energy infrastructure provides the foundation for secure and reliable access to the energy supplies and services on which Florida depends. Therefore, there is significant value to Florida consumers that comes from investment in Florida's energy infrastructure that increases system reliability, enhances energy independence and diversification, stabilizes energy costs, and reduces greenhouse gas emissions.

## INTRODUCTION TO FGS

FGS is proposing to build and operate a natural gas storage facility ("Floridian") in Martin County, Florida with a targeted in-service date of the first quarter of 2012. As shown below, Floridian will be interconnected to the two primary interstate natural gas pipelines in Florida, Florida Gas Transmission ("FGT") and Gulfstream Natural Gas System LLC ("Gulfstream"). As a result, gas supplies from Floridian should be accessible to customers on the east and west coast of Florida as well as the Panhandle.



Floridian will be capable of storing 8 million MMBtu of natural gas in liquid form, liquefying (i.e., injecting) into storage 50,000 to 100,000 MMBtu of natural gas per day, and vaporizing (i.e., withdrawing) from storage 400,000 to 800,000 MMBtu per day.<sup>2</sup> Similar to Floridian, other peaking LNG facilities are in various stages of development across North America. Specifically, Piedmont Natural Gas located primarily in North Carolina has announced an expansion of their existing LNG peaking facility; Terasen Gas in British Columbia has begun construction of an LNG peaking facility; and Yankee Gas in Connecticut has recently put into service a new LNG peaking facility. One benefit of LNG peaking facilities is the ability to locate<sup>3</sup> these facilities in the market area thus avoiding interstate pipeline bottlenecks, and potentially the cost of that pipeline infrastructure.

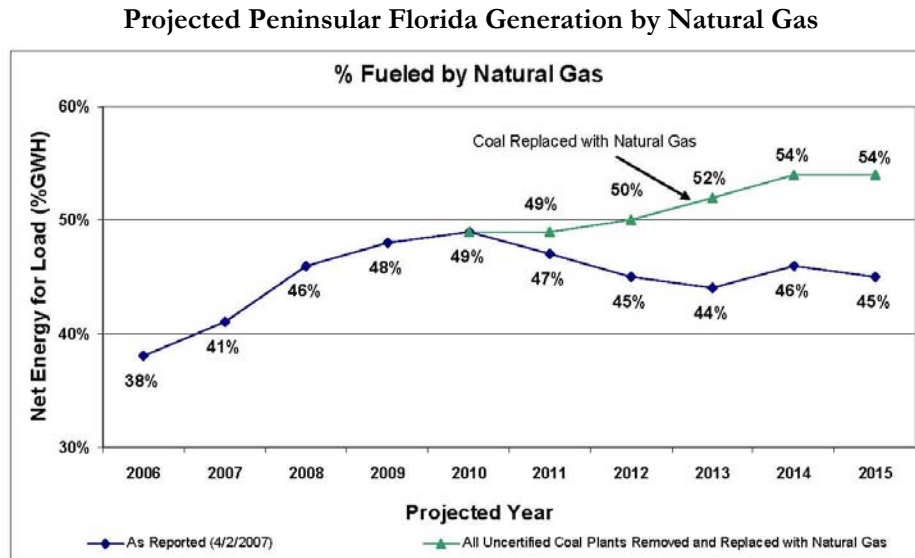
<sup>2</sup> Floridian has received approval from the FERC for 100,000 MMBtu per day liquefaction and 800,000 MMBtu per day vaporization; *Floridian Natural Gas Storage Company, LLC*, 24 FERC ¶ 61,214 (2008) at Mimeo p. 6. It is Concentric's understanding that Floridian can support the fully permitted volumes (e.g., 100,000 MMBtu per day of liquefaction) with minimal impact on the current project economics.

<sup>3</sup> EIA, "U.S. LNG Markets and Uses", January 2003, p. 8.

## FLORIDA ENERGY MARKET – OVERVIEW

As stated earlier, Florida is facing greater energy supply challenges than it has confronted in the past. Due to an increasing population, the demand for electricity in Florida has continued to grow. As a result of this growth in electricity requirement, natural gas consumption has also increased.

Natural gas usage for electricity generation is forecasted to increase by approximately 40% over the next ten years. Specifically, as illustrated by the chart below, by 2015 natural gas-fired generation is forecasted to represent 54% of the net energy load in Florida assuming all the canceled coal plants are replaced by natural gas.<sup>4</sup>



The implications of Florida’s increasing dependence on natural gas for electricity generation has been discussed by the Florida Public Service Commission:

“Florida’s increased dependence on natural gas has caused the state to be more vulnerable to supply disruptions due to severe storms and hurricanes.”<sup>5</sup>

“As the state’s dependence on natural gas–fired generation continues to grow, gas supply and deliverability become increasingly important. Therefore, utilities should continue evaluation of natural gas supply and delivery options, such as liquefied natural gas, alternate gas pipelines, and natural gas storage. Having multiple options can serve as risk mitigation to unforeseen supply and delivery disruptions.”<sup>6</sup>

As a result of the increasing reliance on natural gas for electricity generation the need for diversification in natural gas supplies has increased. This supply diversity issue was addressed by a Florida Public Service Commission order regarding a Progress Energy Florida (“PEF”) contract.

<sup>4</sup> Florida Public Service Commission, “Review of 2007 Ten-Year Site Plans for Florida’s Electric Utilities,” December 2007 p. 14.

<sup>5</sup> Ibid., p. 8.

<sup>6</sup> Ibid., p. 15.

Specifically, On July 5, 2005 the Florida Public Service Commission issued its final order approving certain PEF contracts and stated the following regarding natural gas supply diversity and reliability:

*Supply Diversity:* Natural gas generation in Florida is expected to increase from approximately 30 percent to over 50 percent over the next ten years, placing added pressure on current natural gas supplies and transportation capacity. Currently, most gas supplied to PEF and the state of Florida comes from the Mobile Bay/Destin area, and is transported through two major pipelines. The proposed contracts will add a new source of gas supply and transportation to the state. The resulting increase in fuel diversity should have a positive impact on gas supply economics and reliability. This is especially important given the projected increase in natural gas-fired generation.<sup>7</sup>

In summary, the electricity demand in Florida is forecasted to increase at a significant rate and coupled with the recent cancellation of certain coal-fired generation will result in an increased dependence on natural gas for electric generation. This increase in natural gas consumption would suggest a need for a diverse portfolio<sup>8</sup> of natural gas sources and assets.

### **Issue 1 – Growing Role of Natural Gas**

As noted above, the Florida energy market has grown significantly and that growth is forecasted to continue. As a result, natural gas will play a more prominent role in meeting the growing electricity demand of Florida. The interdependence of electricity generation and natural gas supply was recently addressed by the Florida Energy Commission:

Energy infrastructure provides the foundation for secure and reliable access to the energy supplies and services on which Florida depends. The state's energy infrastructure is comprised of many components, and is complex and interconnected...Generation plants require a dependable transportation infrastructure to deliver the necessary fuels to the power plants...Maintaining a balanced fuel supply adds value in terms of supply reliability and price stability. Fuel diversity is not always a cost-savings measure, but rather a risk-mitigation strategy...If, for example, natural gas becomes the sole replacement fuel of choice, this will result in natural gas generation producing more than 50 percent of Florida's energy as early as 2013. Given the state's vulnerability to supply disruptions, and the continued volatility in natural gas prices, this trend is problematic.<sup>9</sup>

As noted by the Florida Energy Commission, the objective of fuel diversity may not result in reduced cost but rather should be viewed as a supply risk management issue. Stated differently, to manage the risk of a supply disruption may result in additional cost similar to an insurance premium.

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<sup>7</sup> Florida Public Service Commission, "Final Order No. PSC-05-0721-FOF-EI", p. 5.

<sup>8</sup> "The Florida Public Service Commission (PSC) concluded that energy demand forecasts continue to surpass current energy conservation and renewable energy programs offered by Florida's utilities and that local utilities should continue investigating natural gas supply delivery options such as natural gas storage to maintain diversity in the face of unplanned supply interruptions". *Floridian Natural Gas Storage Company, LLC*, 24 FERC ¶ 61,214 (2008) at Mimeo p. 36.

<sup>9</sup> Florida Energy Commission, "2007 Florida Energy Commission Report to the Legislature"; December 31, 2007 p. 91.

In addition to enhancing the diversity of Florida's natural gas resources, Floridian offers additional natural gas supply benefits. For example, natural gas is the likely fuel choice for certain peak generation requirements. Specifically, in 2007 the Florida PSC projected 1,738 MW of additional combustion turbine and diesel generation would be required by 2016. If all 1,738 MW of forecasted combustion turbine and diesel generation were natural gas fired then the associated daily natural gas capacity requirement would be approximately 400,000 MMBtu (which is equivalent to 50% of the maximum vaporization capacity of Floridian). The Florida Public Service Commission also noted the low load factor of the peaking electric generation units (i.e., combustion turbine units may only run between 5 and 20% of the day, or 1 to 5 hours). This type of natural gas demand (i.e., low load factor demand) would result in underutilized interstate pipeline capacity but would be efficiently served by the type of peaking and load balancing service offered by Floridian. In other words, Floridian, given its location and capability, would be well suited to serve this hourly demand profile in a more efficient manner than out of state storage and pipeline capacity.

## **Issue 2 – Natural Gas Portfolio**

One of the advantages of Floridian is how it will augment or complement the existing natural gas portfolio of the Florida utilities. Currently a typical Florida utility natural gas portfolio consists of various assets/contracts (e.g., interstate pipeline, out of state Gulf Coast natural gas storage and natural gas supply). The integration of the various natural gas assets/contracts results in a resource portfolio to meet a changing natural gas demand profile. In addition, a portfolio of resources will be more responsive regarding a disruption of one of the assets. Floridian, as part of a resource portfolio, would assist with the management of natural gas supply risk by diversifying the resource portfolio. Stated differently, the inclusion of Floridian into an existing resource portfolio may augment or complement the existing portfolio assets (e.g., out of state Gulf Coast storage). Floridian would complement the current natural gas assets used to serve Florida demand in several ways:

- Floridian provides a strategic reserve of natural gas in south Florida designed to deliver natural gas to where and when it is most needed.<sup>10</sup>
- Floridian will utilize the existing natural gas infrastructure thereby decreasing the need for incremental interstate pipeline additions and increasing utilization of the existing infrastructure. Specifically, under-utilized pipeline capacity will be used to fill or inject natural gas into Floridian while backhaul transportation or capacity segmentation may be utilized to withdraw natural gas from Floridian.
- Natural gas storage is an important component in any natural gas portfolio; however when comparing out of state Gulf Coast natural gas storage to Floridian the cost of each resource is not the appropriate analysis, rather the delivered cost from each asset into Florida is the more appropriate analysis. In other words, if the resources are being evaluated with respect to incremental load the appropriate cost comparison is the cost to deliver out of state storage gas to Florida compared to the cost of Floridian. Specifically, the incremental increase in Florida natural gas demand will require incremental interstate pipeline capacity to

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<sup>10</sup> “Having gas stored at the FGS facility will enable these electric generator customers to better manage their fuel supplies because they will have an at-the-ready source of natural gas when needed for peaking supplies or when the market or weather conditions, such as hurricanes, necessitate access to an additional supply source”. Floridian *Natural Gas Storage Company, LLC*, 24 FERC ¶ 61,214 (2008) at Mimeo p. 6.

deliver storage gas to Florida. As a result, the cost of out of state storage should include the cost of new interstate pipeline capacity needed to deliver that gas into Florida (i.e., the delivered cost).

- A benefit of Floridian in the portfolio is the optionality/flexibility advantages created by Floridian regarding interstate pipeline capacity segmentation. Specifically, Floridian may allow unused capacity (i.e., inject into Floridian whenever Florida gas demand is less than contracted pipeline capacity or when interruptible capacity is available) to be converted into peak day or peak hour deliverability (i.e., withdraw from Floridian during peak demand). To better illustrate this point please see Attachment 1. As shown in the Attachment, under Scenario 1, injections would occur during an average day demand thus increasing utilization of the existing pipeline infrastructure. In addition, the Attachment provides two examples of peak demand management. In Scenario 2A the peak demand is managed by utilizing oil backup, while in Scenario 2B peak demand is managed by withdrawals from Floridian and capacity segmentation with no oil backup. Therefore injections on average day demand have been converted to peak deliverability, with a reduction in GHG emissions.
- Given the decline in oil consumption coupled with the focus of GHG reductions, in the future, the backup fuel for natural gas may not be oil, but rather another (i.e., diverse) source of natural gas. Future natural gas reliability may not include oil backup, but rather, a more geographically diverse gas supply portfolio.
- As the current natural gas pipelines become fully subscribed or contracted the ability of the market (e.g., excess pipeline capacity) to provide swing peaking service may be diminished, thus increasing the value of a flexible resource like Floridian.
- Floridian provides each customer with the flexibility to customize how Floridian is utilized on any hour, day or season, for example:
  - As a hurricane hardening asset that would allow the customer to better manage risk (e.g., pipeline curtailments or natural gas supply interruptions);
  - As a peaking resource to better manage peak day and/or peak hour requirements; and
  - As a back-up fuel supply that may replace oil consumption thereby reducing emissions.

### **Issue 3 – Environmental Benefits**

Florida, like many other states, has recently adopted GHG reduction goals and is looking to the power generation sector to take a leading role in lowering GHG emissions. While new nuclear power plants and renewable energy sources hold the promise to deliver significant future GHG reduction benefits for the power generation sector, substituting cleaner burning natural gas for oil in existing power plants offers a tangible means to reduce the power sector's carbon profile in the near term. For each turn of its 8 million MMBtu storage capacity, Floridian could displace as much as 58 million gallons of distillate fuel oil or 53 million gallons of residual fuel oil. On a comparable per MMBtu basis, natural gas emits 27% less carbon dioxide than distillate fuel oil and 33% less carbon dioxide than residual fuel oil when burned for power generation applications. For example, if the entire inventory of Floridian was consumed at an electricity generation facility and therefore displaced an equivalent volume of fuel oil the annual carbon emissions for that plant would be

reduced by approximately 227,000 tons.<sup>11</sup> For comparison purposes the 110 MW of advanced solar facilities recently proposed by FPL would result in an annual carbon emission reduction of approximately 118,400 tons. Natural gas also produces fewer SO<sub>2</sub>, NO<sub>x</sub>, and other harmful air emissions when burned for power generation.

#### **Issue 4 – System Reliability and Vulnerability**

As Florida's demand for natural gas grows in the future, hurricane hardening, system reliability, and mitigation of fuel supply risks for power generators will take on added urgency. As stated by Director Fugate from the State of Florida Division of Emergency Management:

"As you know, our mission is to ensure that Florida is prepared to respond to emergencies, recover from them, and mitigate against their impacts. The rapidly increasing demand for natural gas may create greater risks for Florida and we recognize that power generation and local distribution companies will be more vulnerable to supply interruptions in the coming years. Natural gas storage is one well tested tool to mitigate those risks which compliments (*sic*) existing and new pipeline capacity into the State. From a system reliability, supply security, and infrastructure standpoint, we believe it is important that the state have increased resources to aid in disaster preparedness planning and that provide high daily deliverability during emergencies."<sup>12</sup>

This point has been widely discussed as evidenced by the various comments below:

"...As the recent hurricanes Katrina and Rita proved, natural gas supplies are subject to interruption. In the aftermath of Katrina, for example, due to the shutdown of natural gas production facilities in the Gulf of Mexico, FPL was limited in the available amount of natural gas to run its power plants."<sup>13</sup>

"...The company also said that if it has to build natural gas-fired plants in lieu of the clean coal plant, that by 2016 it will be 70 percent dependent on this fuel source, exposing customers to risks in reliability, and ultimately higher prices...It also increases the likelihood of electricity disruptions in the event that hurricanes in the Gulf of Mexico disrupt the natural gas supply to Florida, as was the case with Katrina and Wilma in 2005."<sup>14</sup>

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<sup>11</sup> Assuming a heat content of natural gas of 1.03 MMBtu per Mcf and an emissions rate of 117.08 pounds per MMBtu consumed, the natural gas stored in FGS would produce approximately 468,000 tons of CO<sub>2</sub>. Assuming a heat content of residual oil of 6.39 MMBtu per barrel and an emissions rate of 173.91 pounds of CO<sub>2</sub> per MMBtu consumed, the equivalent amount of residual oil displaced by FGS would emit approximately 695,000 tons on CO<sub>2</sub>. Subtracting 468,000 tons from 695,000 tons results in a difference of 227,000 tons.

<sup>12</sup> February 27, 2008 letter from Craig Fugate, Director Division of Emergency Management to Floridian Natural Gas Storage Company.

<sup>13</sup> www.FPL.com

<sup>14</sup> Ibid.

“...Furthermore, the supply of natural gas we get from the Gulf of Mexico is susceptible to interruption from hurricanes such as we experienced with Katrina and Wilma in 2005. Such a situation could present significant reliability issues...”<sup>15</sup>

“...Tampa Electric relies on coal for about 55 percent of its power, and natural gas for the rest...The new plant will boost natural gas to 48 percent. If the utility continues to invest in natural gas, that will leave it further exposed to higher prices and weather-related disruptions in supply.”<sup>16</sup>

“...One of our biggest concerns, quite frankly, is the physical reliability. As we saw a couple of years ago, we can have situations with tropical storms, hurricanes in the Gulf affecting production, which have a real impact on our service territory, even when our service territory is unaffected by the tropical storm itself.”<sup>17</sup>

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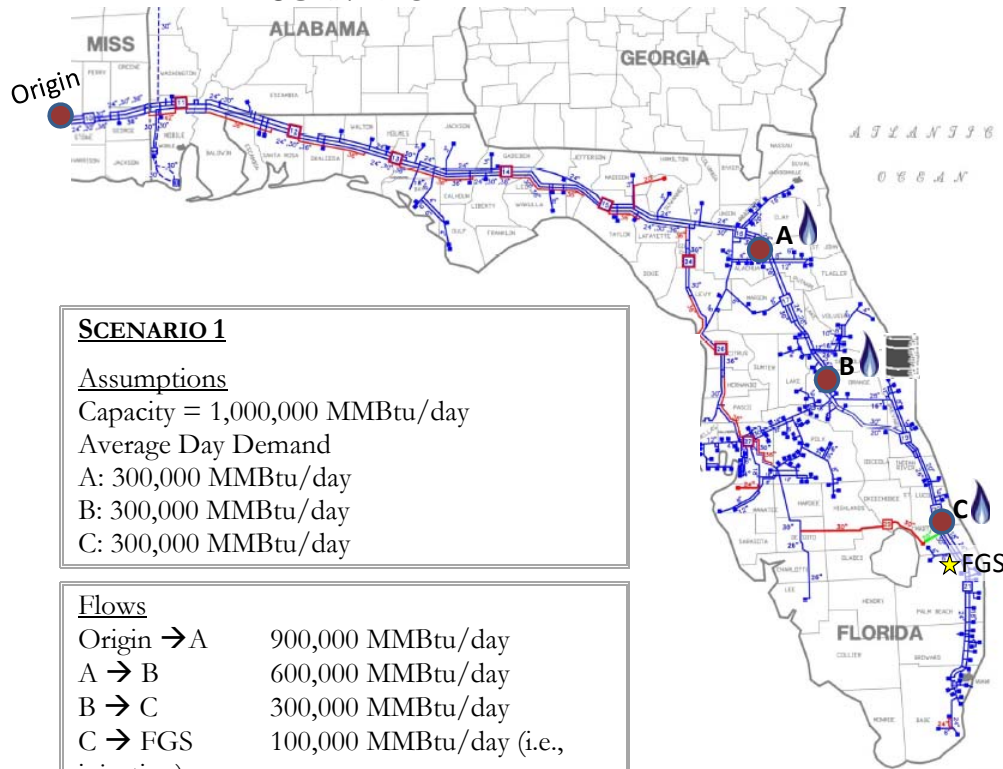
<sup>15</sup> Ibid.

<sup>16</sup> [www.SPTimes.com](http://www.SPTimes.com)


<sup>17</sup> FPL Group, Inc. Q2 2007 Earnings Call. July 30, 2007.


**FGT / SINGLE UTILITY WITH 3 GENERATION PLANTS – ILLUSTRATIVE EXAMPLE OF CAPACITY SEGMENTATION**

**SCENARIO 1**



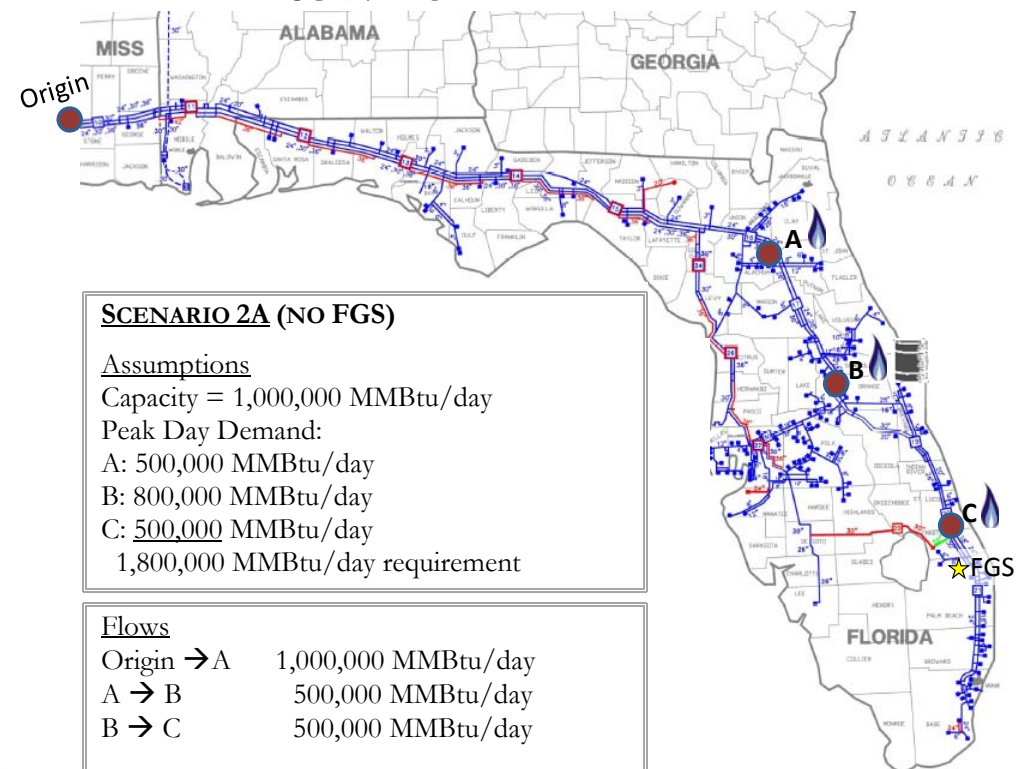
**KEY:**

 Natural Gas

 Dual Fuel

**CONCLUSION:** Utility gets 1,800,000 MMBtu of peak deliveries made with same 1,000,000 MMBtu/day of capacity and no oil consumed.

**SCENARIO 2**



**SCENARIO 2B (WITH FGS)**  
 Same demand, same capacity

<u>Flows</u>		<u>Comparison to Scenario 2A</u>
Origin → A	1,000,000 MMBtu/day	(same)
A → B	500,000 MMBtu/day	(same)
C → B	300,000 MMBtu/day	(reverse, segmentation)
FGS → C	800,000 MMBtu/day	(reverse, segmentation/or direct connect)

## **ILLUSTRATIVE EXAMPLE OF FGS AND FGT CAPACITY SEGMENTATION**

The previous page depicts how FGT capacity holders can pair FGS with the capacity segmentation feature of the FGT tariff to enhance gas deliveries to Florida power plants without adding new pipeline capacity. Pipeline capacity holders contract for a specific quantity of capacity to flow natural gas from one or more receipt points to one or more delivery points, i.e., a contract path. For example, on the previous page the contracted capacity path is for a maximum of 1,000,000 MMBtu/day with receipt at a location West of Florida (“Origin”) and delivery of up to an aggregate of 1,000,000 MMBtu/day at any combination of Power Plants A, B, and C and/or at FGS. (Please note that for purpose on this illustrative example FGS is considered a receipt and delivery point). Capacity segmentation refers to the ability of pipeline capacity holders to split a contract path into two or more sub-paths or “segments”, each with defined receipt and delivery points(s). Subject to the provisions of the pipeline’s tariff and operating conditions, the capacity holder may then separately and simultaneously schedule gas flows on each segment of the contract path, provided that the flow from receipt point to delivery point on any given segment does not exceed the contract path capacity for that segment.

Scenario 1 on the previous page depicts the capacity holders’ utilization of existing FGT capacity on a day when the shipper only requires an aggregate of 900,000 MMBtu/day at Power Plants A, B and C (the “Average Day Demand”). During such conditions the capacity holder:

- schedules receipt of 1,000,000 MMBtu of gas at the Origin;
- schedules gas deliveries to fully meet gas demand of 300,000 MMBtu/day at each of the power plants; and
- has unutilized FGT capacity sufficient to schedule 100,000 MMBtu to flow from Origin to FGS for injection into storage.

Scenario 2 on the previous page depicts gas demand and FGT capacity utilization on a peak demand day when aggregate power plant gas demand reaches 1,800,000 MMBtu (“Peak Day Demand”). In Scenario 2A, the capacity holder:

- has not contracted for FGS service and operationally cannot take advantage of FGT capacity segmentation flexibility;
- has limited ability to deliver gas to the three power plants due to the quantity of gas it can schedule from the Origin, i.e., 1,000,000 MMBtu /day; and
- switches its dual-fired Plant B to burn fuel oil equivalent of 800,000 MMBtu of gas and fully utilizes its FGT capacity to schedule deliveries of 500,000 MMBtu of gas each at Plants A and C.

In Scenario 2, the capacity holder has delivered 1,000,000 MMBtu of gas to two power plants and burns fuel oil equivalent to 800,000 MMBtu of gas at Power Plant B.

Scenario 2B depicts the same Peak Day Demand (i.e., 500,000 MMBtu at Power Plants A and C and 800,000 MMBtu at dual fuel Plant B). However, having contracted for FGS service, the capacity holder:

- has positioned itself to segment its FGT capacity into two sub-paths:
  - schedules 1,000,000 MMBtu of gas at the Origin with delivery of 500,000 MMBtu at each of Plants A and B; and
  - schedules 800,000 MMBtu of gas from FGS (i.e., withdrawal) with delivery of 500,000 MMBtu at Plant C and the remaining 300,000 MMBtu at Plant B.

Under the Scenario 2B conditions, the capacity holder has utilized its 1,000,000 MMBtu/day of contracted forward haul capacity to deliver a total of 1,800,000 MMBtu of gas, fully satisfied each power plant's daily gas requirement, and reduced GHG emissions.