Florida Public Service Commission
Ten-Year Site Plan Workshop
September 7, 2011

Tampa Electric Company Update

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Agenda

- Status update of U.S. Department of Energy grant for carbon sequestration pilot project and impact on generation reserves.
- Results of studies for possible modification of 20% reserve margin criterion.

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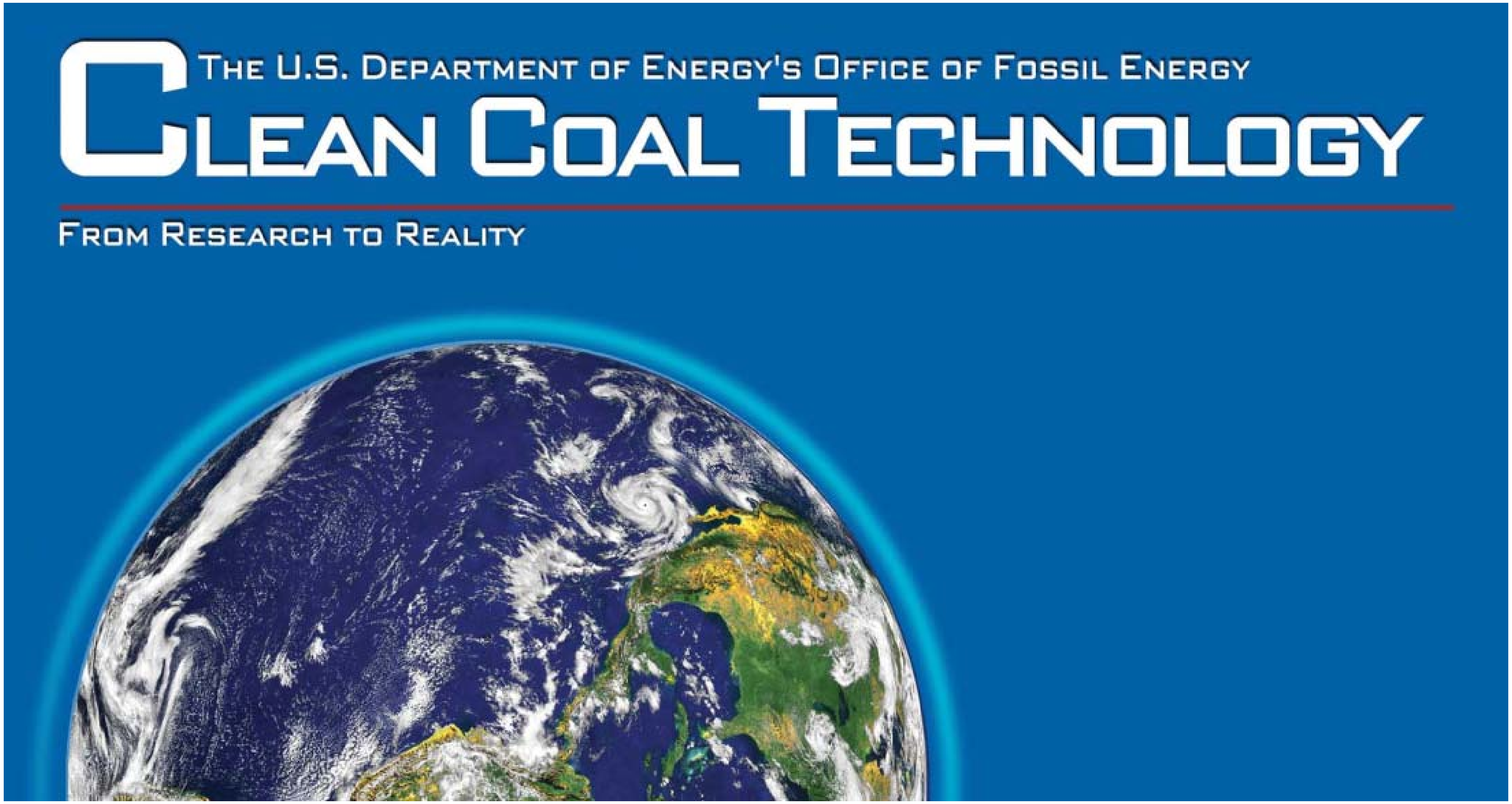
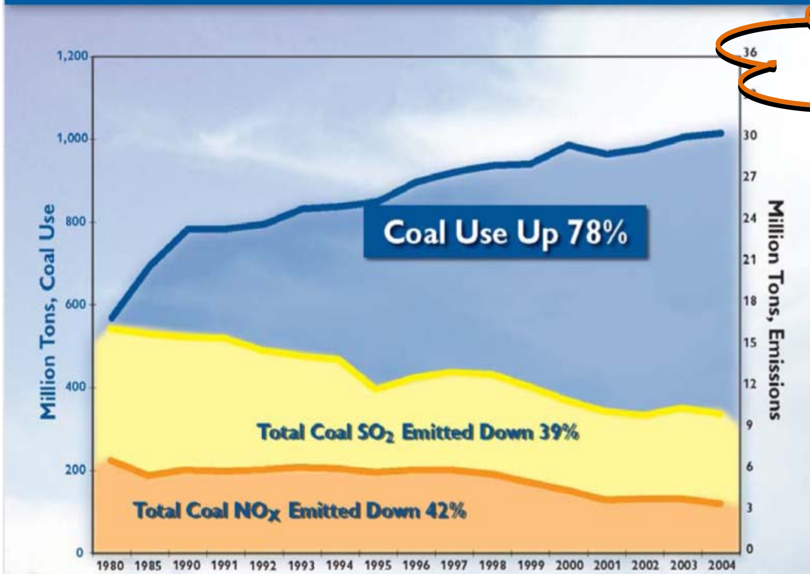


- Tampa Electric's Polk Power Station Unit 1, entered commercial service in 1996 and was partially funded by U.S. DOE Clean Coal Technology program.

- DOE views Clean Coal Technology, now including Carbon Capture and Sequestration, as important to the nation's long term energy future.

Coal Use Up, Pollution Down in Electricity Generation



All data in million short tons. Figures are rounded. Total emissions reductions are due to several factors, which include increased commercialization and deployment of clean coal technologies.

(Sources: Energy Information Administration, Environmental Protection Agency)

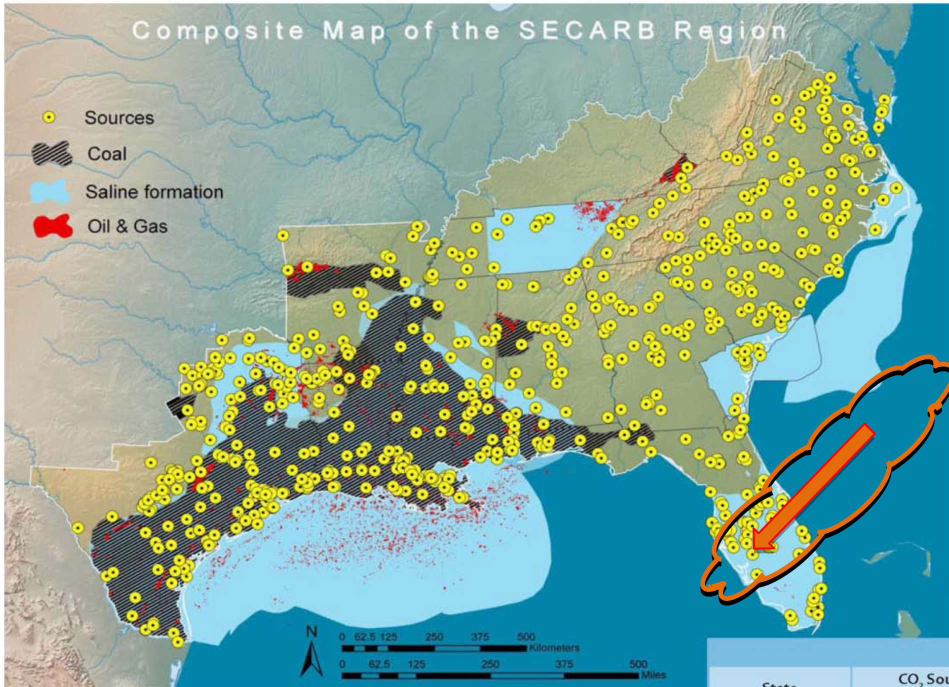
Clean Coal Technology = Advanced Coal Power Systems

- Two "super clean" coal-based IGCC demonstration plants have operated reliably: Tampa Electric IGCC Power Plant in Mulberry, Fla., and PSI Energy Wabash River IGCC Power Plant in West Terre Haute, Ind.
- The JEA Northside Generating Station in Jacksonville, Fla., is one of the world's largest circulating fluidized bed combustion power plants.
- Future demonstrations of carbon capture and storage technologies are planned at multiple commercial-scale integrated gasification combined-cycle (IGCC) coal power plants that will be operational by 2015

Highlights — Research and Development

- Demonstrations of two mercury control technologies for existing plants aimed at 50–70 percent removal now and 90 percent removal in a few years.
- Lignite drying technology that can raise generating efficiency and lower pollution.
- Moving clean coal technology forward, including improvements to IGCC, bringing down the cost of CO_2 capture, finding better ways to store carbon dioxide, moving toward a hydrogen economy.
- By 2012, advanced turbines, capable of firing up to 100 percent hydrogen, will be integrated into power plants that separate and capture CO_2.
- Continued concentration on lowering the costs of pre- and post-combustion capture of CO_2.
- Continued concentration on identifying, validating, and testing suitable sites for safe, long-term CO_2 storage.
- By 2015, build on R&D advancements in IGCC and CCS technologies achieved over the past five years to at least double the amount of carbon dioxide sequestered, compared with earlier goals.

DOE's Southeast Regional Carbon Sequestration Partnership (SECARB) information



Composite Map of CO_2 Sources and Geologic Storage Formations

The distance between stationary source and geologic storage formation is calculated as the shortest straight-line distance from each point. While these results do not give a complete picture of the transportation and infrastructure requirements, it does give a first-order interpretation of the magnitude of the requirements.

The sources in SECARB match up well with the potential storage reservoirs. For example, more than 70 percent of all sources (by volume) in the SECARB region are located within 50 kilometers of a storage site. Approximately 40 percent of the sources are co-located with an appropriate storage site. This especially occurs in the Gulf Coast region where many of the sources overlie saline formations, coalbeds, or both.

The table below identifies how many years' storage is possible, given the current annual emissions and the known CO_2 storage resource.

Drill core and drill chip logging from site characterization at the Mississippi Test Site. (Courtesy of Southern Company and Advanced Resources International)

Estimated Years of Storage

State	CO_2 Sources (Million Metric Tons)	CO_2 Storage Resource (Million Metric Tons)				Number of Years Storage ***
	Total	Oil and Gas	Coal and Shale*	Saline*	Total	
AL	[illegible]	344	1,944	[illegible]	15,188	[illegible]
AR	35	250	15,675	4,304	20,229	572
FL	143	109	1,275	16,725	18,109	127
GA	90	-	-	4,909	4,909	55
LA	102	6,781	8,325	139,497	154,603	[illegible]
MS	34	399	5,400	[illegible]	[illegible]	1,546
NC	77	[illegible]	[illegible]	1,352	1,352	18
SC	40	-	-	1,995	1,995	49
TN	66	-	-	500	500	8
TX**	373	4,005	33,025	205,548	242,578	650
VA	46	10	231	159	400	9
Federal Offshore	N/A	17,754	-	484,996	502,750	N/A
Total	1,085	29,652	65,875	919,313	1,014,840	935****

* Low estimates used.
** Eastern Texas, TRRC Districts 1–6.
*** Years of CO_2 storage at the current emission rates (State CO_2 storage resource/State annual emissions).
****Average years storage for whole SECARB area (total CO_2 storage resource/total annual emissions).

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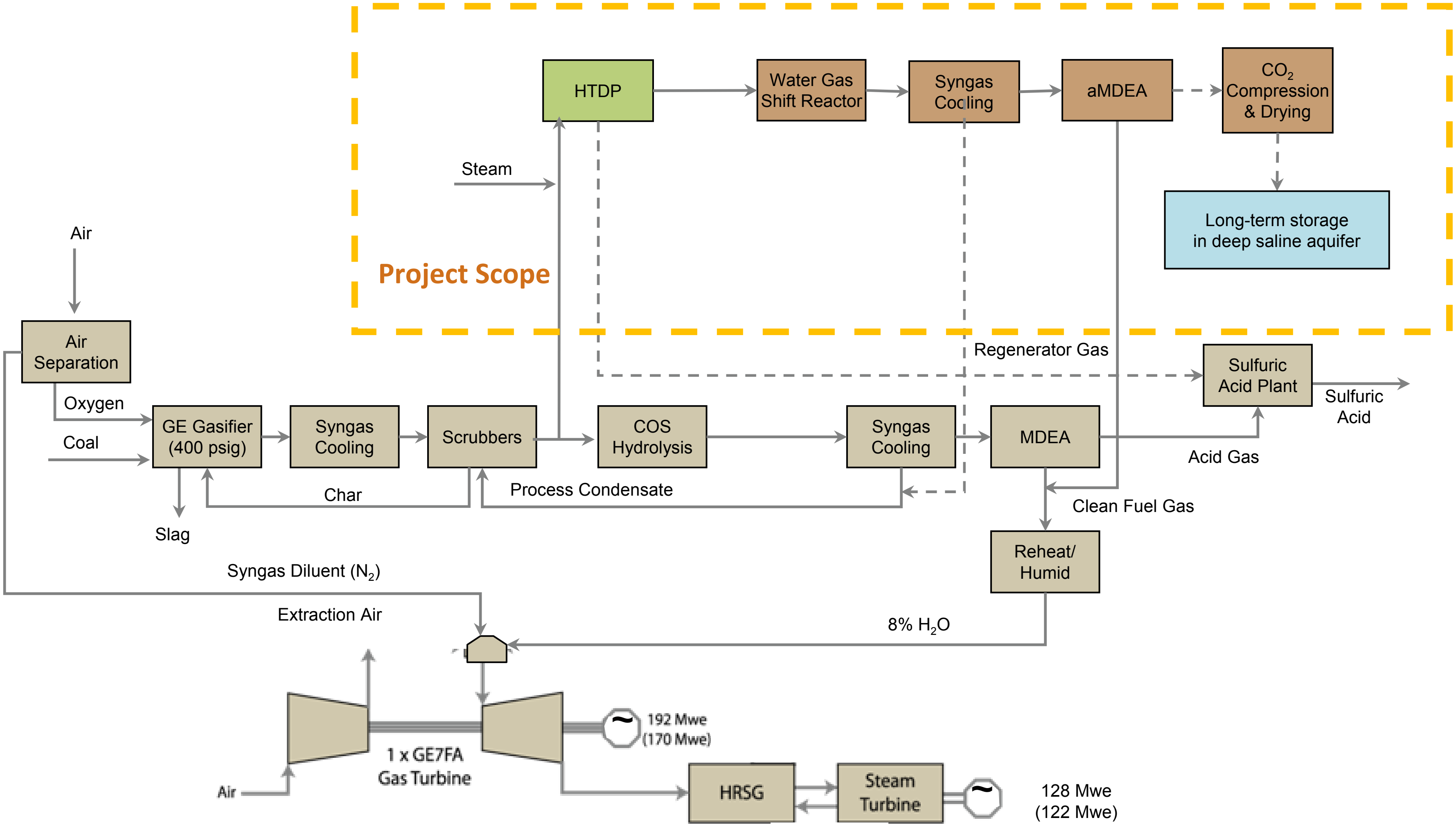
Polk Carbon Sequestration Demonstration Project

- On September 7, 2010, the U.S. DOE announced the funding of a project to demonstrate a warm gas cleanup system (WGC) to remove sulfur at elevated temperature along with the integration of Carbon Capture and Sequestration (CCS).
- DOE funding level is $168.8M.
- Project is designed to treat a portion (≈25%) of the syngas produced by the Polk 1 gasifier by removing sulfur and CO_2, then returning the treated gas to the process for use in power production.
- Operation of the pilot project would take place in 2014 and early 2015.

Integration of Warm Syngas Cleaning and CCS



Key Project Participants/Goals

- **US Department of Energy**
  - Funding project, $168.8M, Clean coal program and ARRA funds
  - Demonstrate WGC/CCS at operating IGCC, high visibility strategic project for DOE
- **RTI International**
  - Prime contractor, WGC technology owner
  - Develop WGC technology for licensing revenue
- **Tampa Electric**
  - Host site, sequestration permitting/operation
  - Evaluate technology, demonstrate CCS, option to retain equipment for future use
  - Utilize one injection well from ongoing Regional Reclaimed Water Project
- **Shaw Group**
  - Engineering, construction, operation
  - Potential technology owner
- **BASF**
  - CO_2 capture technology owner
- **University of South Florida**
  - Geologic research and modeling

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Regional Reclaimed Water Project
Utilize waste water from City of Lakeland to increase water supply to Polk and offset ground water use.

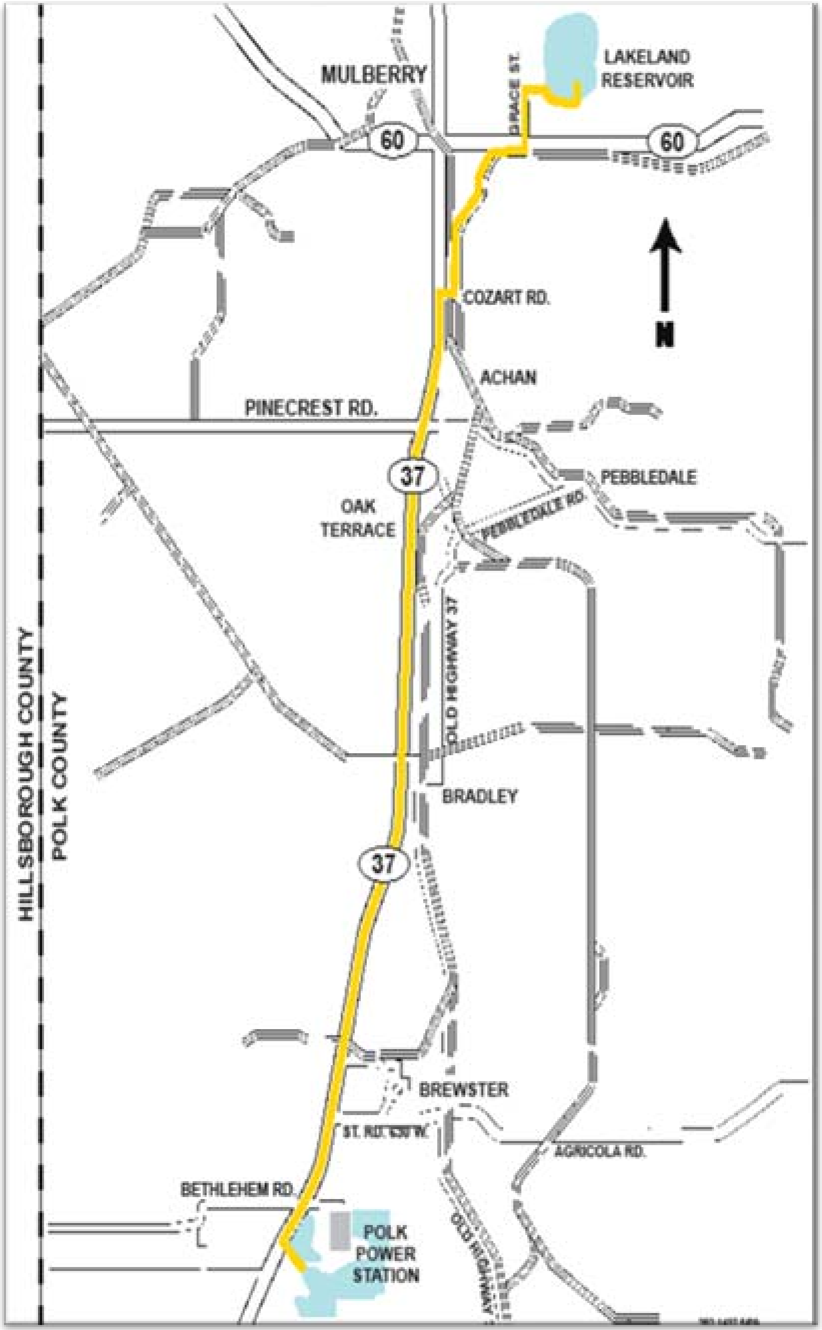
<u>Project Elements</u>

Pipeline - Approximately 15 miles of pipeline routed from Lakeland reservoir on SR60 to Polk Power Station

Treatment System - Process reclaimed water using a reverse osmosis system in conjunction with pretreatment technologies

Injection Wells - Construction of 2 deep wells for disposal of treatment system effluent.

In service in 2013



CCS Project Synergies with Reclaimed Water Project

- Lakeland reclaimed water project requires installation of two underground injection wells.
- Geologic evaluation for water injection is useful to understand CO_2 injection potential.
- During the CCS demonstration period, one well could be used for CO_2 injection and still serve as backup to primary water injection well.
- Use of injection well for CO_2 is considered an “in-kind” contribution towards DOE cost sharing requirement (no incremental expense for Tampa Electric or it’s customers).

PPS Site Suitability for CCS

- Suitable Deep Injection Zone – (4100’ to 8000’, CO_2 fluid).
- Excellent Confining Unit/Caprock.
- Geologic/Structural Traps.
- Seismic Suitability/Stability.
- Well Inventory, very few penetrations through confining layer.
- Phosphate Mining & Adjacent Land Use.
- Geochemistry of Injection Zone – indicates very rapid trapping.

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Project Status / Schedule

- Front End Engineering Design (FEED) nearing completion.
- Definitive agreements for detailed engineering, construction and operation being negotiated.
- Construction to take place in 2013.
- Operation to take place in 2014 and first half of 2015.

Operational Objectives and Impacts

- Project will use 25% slipstream of syngas.
- Demonstration equipment can be isolated at any time at TEC's sole discretion.
- Operation of project will reduce net plant output (on the order of 10 MW, to be determined with detailed engineering).
- Project can be isolated, if required, on peak, so rated unit capacity will not change.
- Maintenance of the demonstration system should be able to be done with no impact to Polk Unit 1.

Cost Impacts/Funding

- DOE co-funding will cover the direct costs of this project for Tampa Electric and it's customers.
- Agreements are being developed to provide for reimbursement of labor expense, fuel costs, purchased power and other incremental costs associated with the project.
- Tampa Electric's contribution will be limited to the "in-kind" value of utilizing injection well 2 for CO_2 storage. No incremental expense.

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Reserve Margin Considerations

- Peninsular Florida with limited interconnections.
- IOUs provide a large amount of supply side support for state.
- Forced outages occur randomly.
- Instantaneous peaks may exceed planning peaks.
- Size of units versus total TEC system.
- Historic peak demand versus available capacity.

TEC Generating Units

Type	Unit	Net Summer MW	% of TEC System
Base	Big Bend 1	385	9% *
Base	Big Bend 2	385	9% *
Base	Big Bend 3	365	9%
Base	Big Bend 4	417	10%
Base	Polk 1	220	5%
Intermediate	Bayside 1	701	16%
Intermediate	Bayside 2	929	22%
Peaking	Bayside 3	56	1%
Peaking	Bayside 4	56	1%
Peaking	Bayside 5	56	1%
Peaking	Bayside 6	56	1%
Peaking	Big Bend CT4	56	1%
Peaking	Polk 2	151	4%
Peaking	Polk 3	151	4%
Peaking	Polk 4	151	4%
Peaking	Polk 5	151	4%
Peaking	COT	6	0%
Total		4,292	

*Operate on one FGD system (18% total)

From 2011 TYSP Schedule 1

Historic Peak Demand Versus Available Capacity

- **Monthly 2007-2010**
  - Actual monthly peak demand versus available capacity
    - » 2007 2 months short
    - » 2008 2 months short
    - » 2009 1 month short
    - » 2010 1 month short
- **Annual 2007-2010**
  - Short 3 out of 4 years on annual peak
  - Short 4 out of 4 years on annual peak if TEC was at a 15% RM

Summary

- Decreasing the current 20% reserve margin criterion to 15% will increase the risk of interruption to firm customers during peak demand.
- The relative size of generating units to the total system makes adequate reserve margin more critical.
- Recent history indicates that a 20% reserve margin is appropriate.