ORIGINAL

TAMPA ELECTRIC

TAMPA ELECTRIC COMPANY

BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 992014-EI

TESTIMONY
AND EXHIBIT OF

CHARLES R. BLACK

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

PREPARED DIRECT TESTIMONY

OF

CHARLES R. BLACK

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

A. My name is Charles R. Black. My business address is 702 North Franklin Street, Tampa, Florida 33602. I am Vice President, Energy Supply for Tampa Electric Company ("Tampa Electric" or "company").

Q. Please provide a brief outline of your educational background and business experience.

A. I graduated from the University of South Florida in August 1973 with a Bachelor of Science degree in Engineering, majoring in Chemical Engineering. I am a registered Professional Engineer in the State of Florida. I began my career with Tampa Electric in September 1973 as a staff engineer in the Production Department. Between 1973 and 1989, I held various engineering and management positions in the Production Department, Power Plant Engineering Department, and the Budget Department. In March of 1989, I joined our affiliated company, TECO

Power Services as Director Engineering and Construction. In December of 1990, I was elected Vice President of Engineering and Construction. In December of 1991, I returned to Tampa Electric as Vice President of Project Management. In December 1996 I assumed my present role as Vice President, Energy Supply.

Q. Have you previously testified before the Florida Public Service Commission ("Commission")?

A. Yes, I testified in support of the prudence of Polk Unit One in Docket No. 960409-EI and in support of cost estimates associated with the proposed flue gas desulfurization system in Docket No. 980693-EI. I also testified in the Fuel and Purchased Power Cost Recovery Clause proceeding (Docket No. 990001-EI) describing Tampa Electric's Gannon Unit 6 accident.

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

A. The purpose of my testimony is to describe the repowering of Gannon Station ("Gannon Repowering Project") as required by the Consent Final Judgment ("CFJ") agreed to by Tampa Electric Company and the Florida Department of Environmental Protection ("DEP") and entered by the

Circuit Court in and for the Thirteenth Judicial Circuit on December 16, 1999. Specifically, I will describe the technical design of the project, the impacts of the project on the generating system reliability, the company's plans for utilization of existing equipment, engineering and construction schedule, and the estimated project costs.

Q. Have you prepared an exhibit to support your testimony?

A. Yes. My Exhibit No. ___ (CRB-1), prepared under my direction and supervision, consists of four documents.

Gannon Repowering Project Overview

Q. Please give an overview of the Gannon Repowering Project.

A. The Gannon Repowering Project presently consists of repowering the current coal-fired Units 3, 4, and 5 at Gannon Station with natural gas-fired combustion turbines ("CTs") and heat recovery steam generators ("HRSGs"). At the completion of the project in May 2004 and prior to January 1, 2005, any equipment solely used for coal-fired operations for Units 1 through 6 will be removed from service and the entire station will be fueled by natural gas, with No. 2 oil as backup fuel.

Six natural gas-fired, General Electric 7FA CTs will be installed at Gannon Station. Six HRSGs will be installed, one adjacent to each CT. These HRSGs will provide the steam source for the existing Gannon Units 3, 4, and 5 steam turbines/generators and, all combined, the repowered units will provide 1,475 MW of nominal generating capacity. The already low nitrogen oxide ("NO_X") emissions from the 7FA CTs (9 parts per million or "PPM") will be further reduced to 3.5 PPM by installing state-of-the-art selective catalytic reduction ("SCR") equipment on each HRSG as discussed in more detail in the direct testimony of Tampa Electric witness Gregory M. Nelson.

Reuse of the existing Gannon Units 3, 4, and 5 steam turbine/generators is an essential element to the viability of repowering Gannon Station. The capabilities of the existing steam turbines/generators are nominal 180, 188, and 240 MW, respectively. Utilizing the existing steam turbine/generators includes the reuse of their main power transformers, excitation systems and isolated phase bus ducts, condensers, and circulating water systems. As the result of repowering, Gannon Station will go from being one of the highest emitters of sulfur dioxide and NO_X to one of the cleanest generating

facilities in the United States.

Natural gas will be supplied to the facility either from the existing Florida Gas Transmission pipeline or from one of the three currently proposed gas supply pipelines. This is described in more detail in the direct testimony of Tampa Electric witness Mark J. Hornick. Document No. 1 of my Exhibit is an artist's rendering of the newly repowered facility.

Q. Do you have an exhibit that shows the location of the major components of the electrical systems of the Gannon Repowering Project?

A. Yes. Document No. 2 of my Exhibit is a detailed schematic of Gannon Station showing the location of the new CTs and HRSGs in relation to the turbine and generators of each unit.

Q. Describe in more detail the CTs and HRSGs that will be utilized in the Gannon Repowering Project.

A. The General Electric 7FA CT is one of the most common CTs being used by the power industry for the construction of natural gas-fired combined cycle power plants. Each 7FA

CT has the capability of producing 180 MW and 155 MW for winter and summer operations, respectively.

By integrating the HRSGs and steam turbines, the effective net heat rate improves from about 10,500 Btu/kWh to about 7,050 Btu/kWh. The gain in unit efficiency is obtained by converting the exhaust heat from the CTs into steam to drive existing steam turbines. The HRSGs and steam turbines will have a combined steam capacity that does not exceed the existing 608 MW of steam turbine capacity associated with Gannon Units 3, 4 and 5. As depicted in Document No. 2 of my Exhibit, there will be two combined cycle units, comprised of three CTs and three HRSGs each. Each combined cycle unit will yield approximately 750 MW of capacity.

Q. Why did Tampa Electric select the "7FA" technology for the Gannon Repowering Project?

A. Initially, Tampa Electric evaluated both "7F" and "G" technology. As described in the direct testimony of Tampa Electric witness Mark D. Ward, the manufacturer of "G" technology did not want its emerging equipment used for repowering applications. Besides this, Tampa Electric recognized benefits of using the "7F" machines.

First, the technology is more readily available and it is proven. The company was not only able to acquire reasonable delivery dates from General Electric, but the company also acquired performance guarantees for the CTs. Moreover, the company believes that the 7FA machines are the best fit for the existing Gannon Station equipment that will be repowered due to their thermodynamic characteristics. Tampa Electric also plans to use "7F" technology as it builds out the Polk site. This will provide for efficiencies in operating and maintaining all of the CTs on our system.

Q. Will the repowered facility have simple cycle capabilities?

A. Most likely, yes. Tampa Electric is currently evaluating the simple cycle design for one CT associated with the repowered Gannon Unit 5. This will provide for 180 MW of capacity even if the repowered unit is down in a planned or unplanned outage. The company is not using the same design on repowered Gannon Units 3 and 4. Since the steam produced by the three CT/HRSG modules are distributed to two turbine/generators, the dual turbine and common steam header configuration provides operational flexibility in the event that one of the

steam turbines is unavailable.

Q. Describe the fuel capabilities for the repowered Gannon Station.

A. The repowered units will be dual-fueled. The primary fuel for the repowered Gannon Station will be natural gas but the facility will also have the ability to use No. 2 oil if natural gas is not temporarily available. As described by Mr. Hornick, the company has been evaluating natural gas transportation alternatives and expects to select an appropriate transportation option by mid-2000. The company does not expect to have any difficulties fulfilling its requirements for natural gas and the company expects to execute both long-term and spot contracts to meet its needs.

Q. Please describe the back-up fuel capability of the repowered Gannon Station.

A. Since the units are dual fueled, No. 2 oil could be used if natural gas were unavailable. The company plans to maintain a four-day supply of No. 2 oil. The company believes it is important to design the facility with dual fuel capabilities given its obligation to reliably serve

its customers.

Q. What will be the generation capability and availability of Gannon Station upon completion of the repowering of Units 3, 4, and 5?

A. As I stated above, the Gannon Repowering Project's generation capability will increase from about 1,200 MW to about 1,475 MW without increasing the existing steam capacity. These repowered units will increase the station availability from about 77 percent to about 91 percent. All of these significant improvements in operational efficiencies, along with the simple cycle ability and the dual fuel capabilities, will enhance the facility's overall efficiency and reliability.

Existing Gannon Station Equipment

Q. Describe the feasibility of repowering Gannon Units 3, 4, and 5.

A. Sargent & Lundy, the A/E firm the company has consulted with for preliminary engineering work, determined that, even though the existing Gannon Units 3, 4, and 5 are 35 to 45 years old, the plant has significant remaining value from existing equipment and infrastructure. Reuse

of these steam turbine/generators is an essential element in the viability of repowering the facility.

Q. What other existing Gannon Station equipment will be reused in the repowering project?

A. Overall, there is a lot of existing equipment that will be used in the Gannon Repowering Project including the following:

- Related heat rejection equipment will be reused. This includes the condenser, once through circulating water system and component cooling water system for cooling miscellaneous equipment heat loads associated with the existing equipment including, but not limited to, steam turbine lube oil coolers and HVAC.

- The existing service and instrument air systems will be reused.

- Fire protection equipment associated with existing structures will remain in place but may require modifications to meet current standards. Fire detection and protection systems will need to be added for new equipment.

- Electrical systems associated with the existing steam turbines (breakers, switchgear, cables, and transformers) will be reused. New electrical equipment rooms will be located near the CT/HRSGs to house related equipment.

- The existing de-mineralized water treatment plant can be utilized to meet the plant's treated water demands for firing CTs with natural gas. However, when firing the CTs on oil, the existing de-mineralized water treatment plant is not sufficient to meet the additional water demands when injecting NO_X control. Therefore, additional de-mineralized water storage tanks will be added. Since the required de-mineralized water usage will increase, a new 4 million gallon tank will need to be constructed to provide sufficient capacity when firing oil.

- Gannon Station's service water and potable water will continue to be provided by the City of Tampa. However, the amount of water required by the repowered facility is significantly less than the existing plant.

Q. What existing Gannon Station equipment will be removed from the site?

A. Tampa Electric does not currently plan to demolish or remove most of the existing equipment and structures. Equipment will be removed only if required in order to minimize construction disruption and to maintain a safe work environment.

Q. What are the company's plans for Gannon Units 1, 2, and 6?

A. According to the CFJ, Tampa Electric cannot burn coal at Gannon Station after December 31, 2004. All coal-related assets including coal-handling equipment will be retired. This includes boilers and ancillary boiler support equipment for Units 1 through 5. The boiler and other equipment at Unit 6 will not be retired in 2004 since the company will retain this equipment for possible conversion to gas, if needed, for emergency and/or reliability reasons. Other coal-related equipment to be retired includes stacks, precipitators, slag sluice system, air preheaters, fly ash silo and ash-handling system, coal bunkers, classifiers, mills, and fans.

The steam turbines/generators and associated non-coal related equipment from Units 1 and 2 will be shut down and placed on reserve standby coincident with the

repowering of Unit 5. Unit 6 will be shut down and placed on reserve standby by the end of 2004. These units will be available to Tampa Electric as future supply-side resource options via repowering to meet the growing demand and energy needs of its customers. The company does not currently have plans to utilize the units, but it may, at some time in the future, repower or convert the units to natural gas if those options prove to be cost-effective.

Project Schedule and Estimated Costs

Q. Please describe the engineering and construction schedule.

A. Document No. 3 of my Exhibit is a summary schedule of the Gannon Repowering Project. The company has already begun engineering the project and expects to start construction in July 2001, with commercial operation of Unit 5 by May 2003. The first three CTs and HRSGs are scheduled to be delivered to the site by the first quarter of 2003. Once Unit 5 is repowered, Units 1 and 2 will be taken off line and placed on reserve status. The repowering of Units 3 and 4 will be completed by May 2004. The CTs and HRSGs, to be connected with Units 3 and 4, will be delivered to the site in the second quarter of 2003. Unit 6 will be

taken off line and placed on reserve status by the end of 2004.

Q. Who will perform the repowering engineering and construction work?

A. As described above, the company has contracted with Sargent & Lundy to perform preliminary engineering of the Gannon Repowering Project. They performed feasibility studies and preliminary cost estimates. Sargent & Lundy has also been selected to perform the detailed engineering for the project. Tampa Electric has selected The Industrial Company to perform the project construction.

Q. How long will each repowered unit be off line in order to accomplish the conversion from coal to natural gas?

A. The time required to have the units off line to accomplish the conversion is expected to take no longer than a normal maintenance outage. This is because the construction of the CTs, the HRSGs and the steam turbines can be accomplished while the units continue to burn coal. The connection of the completed CTs and HRSGs is a relatively simple task that can be accomplished

concurrently with a regularly scheduled maintenance outage.

Q. What is the company's estimate of the capital cost of the Gannon Repowering Project?

A. The company estimates that the capital cost of the Gannon Repowering Project, based on preliminary engineering estimates, is approximately $673 million including allowance for funds used during construction ("AFUDC"). Document No. 4 of my Exhibit provides a more detailed breakdown and estimate of the project's costs. These costs are based upon preliminary engineering estimates prepared by Sargent & Lundy, along with estimates prepared by Tampa Electric's engineering resources.

Q. What is the company's estimate of the annual operating and maintenance costs ("O&M") of the Gannon Repowering Project?

A. The estimate for annual O&M based upon Sargent & Lundy and the company's assessment is about $25 million. This is significantly less than Gannon Station's current O&M. This reduction is primarily attributable to lower O&M associated with gas vs. coal units and lower staffing

costs.

Q. What immediate actions are required by Tampa Electric to meet the Gannon Repowering Project construction schedule you have outlined?

A. As I stated, the company is proceeding with the detailed engineering of the project. The company has already made initial payments on the equipment. It is paramount for the company to proceed quickly in order to meet the environmental compliance deadlines for conversion of Units 3, 4, and 5.

Q. Is the conversion of Gannon Station to burn natural gas compatible with Tampa Electric's Phase II Clean Air Act Compliance Strategy implemented to date?

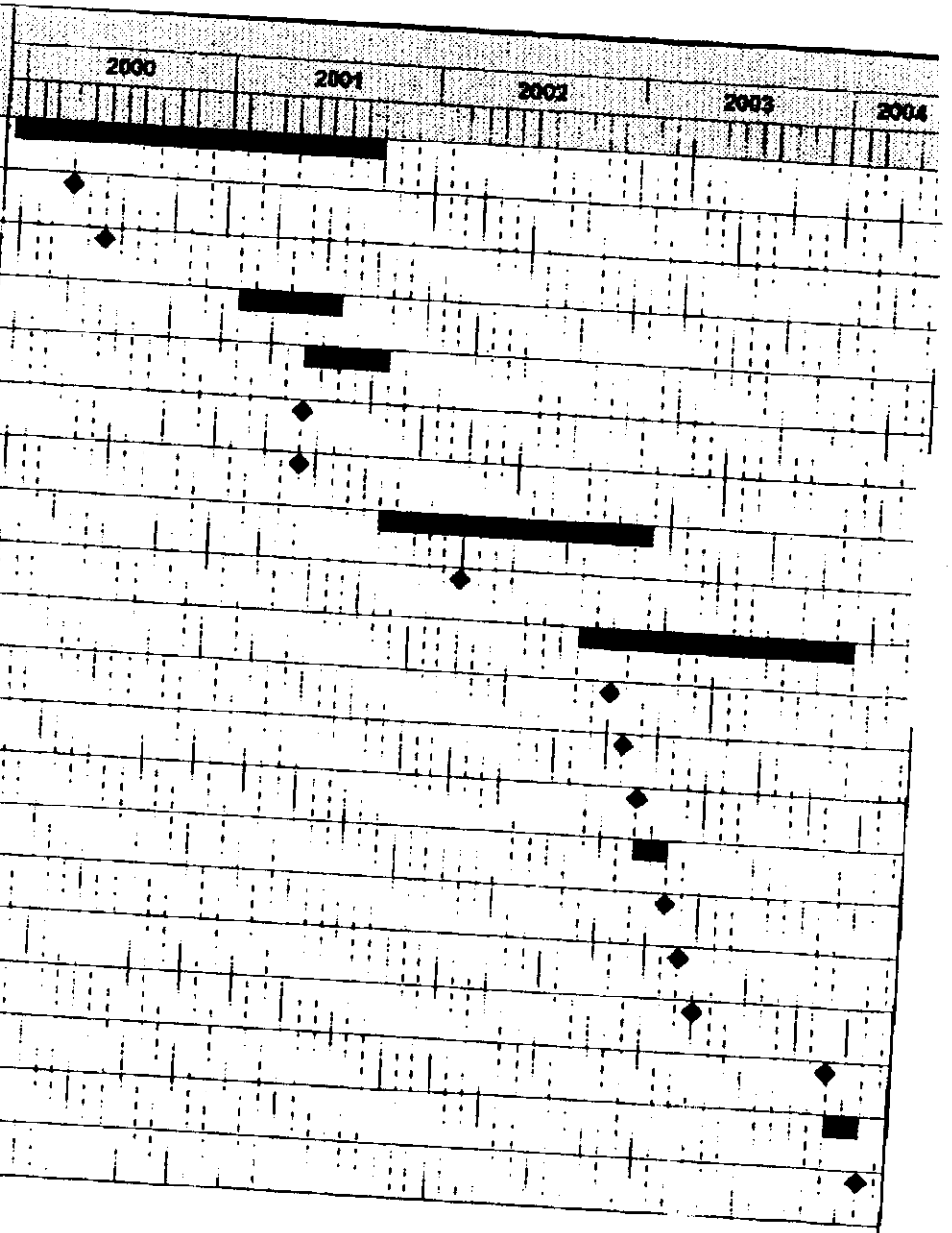
A. Absolutely. This action is incremental to and consistent with the other actions the company has taken to comply with Phase II of the Clean Air Act. The CFJ not only requires the continued operation of the scrubber for Big Bend Units 1 and 2 but it also requires the company to make reasonable efforts to increase the efficiency of this scrubber as discussed in Mr. Nelson's testimony.

As part of Tampa Electric's Phase II Compliance, the company upgraded parts of its Gannon Station coal handling equipment. This upgrade was absolutely necessary to comply with Phase II in order to continue to operate the plant over the next five years until the plant is fully converted to natural gas.

Q. Does this conclude your testimony?

A. Yes it does.

	Start	Finish
Engineering	15DEC99	01OCT01
Submit Air Construction Application	03APR00	
IWW Permit Application	01JUN00	
Tank Demolition & Utilities Relocation	01FEB01	31JUL01
Site Preparation	01JUN01	31OCT01
Receive Air Construction Permit	01JUN01	
Receive Water Permit	01JUN01	
Construction - Unit 5	01NOV01	28FEB03
Unit 5 HRSGs Delivery	31MAR02	
Unit 3 & 4 Construction	01NOV02	29FEB04
Unit 5 CTs Shipment	30DEC02	
Unit 3 & 4 HRSGs Delivery	01FEB03	
Unit 5 Construction Complete	28FEB03	
Unit 5 Start-up & Testing	01MAR03	30APR03
Unit 5 Commercial Operation	01MAY03	
Unit 3 & 4 CTs Shipment #1	30MAY03	
Unit 3 & 4 CTs Shipment #2	30JUN03	
Unit 3 & 4 Construction Complete	29FEB04	
Unit 3 & 4 Start-up & Testing	01MAR04	30APR04
Unit 3 & 4 Commercial Operation	01MAY04	



Project Start 01MAY99
Project Finish 04JUL04
Data Date 01NOV99
Run Date 25JAN00

Current Bar
Progress Bar
Critical Activity

PBOS

Tampa Electric Company
Bayside Power Station
Summary Schedule

Sheet 1 of 1

Sargent & Lundy

TAMPA ELECTRIC COMPANY
DOCKET NO. 992014-EI
WITNESS: CHARLES R. BLACK
EXHIBIT NO. _____ (CRB-1)
DOCUMENT NO. 3

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TAMPA ELECTRIC COMPANY

EXHIBIT OF CHARLES R. BLACK

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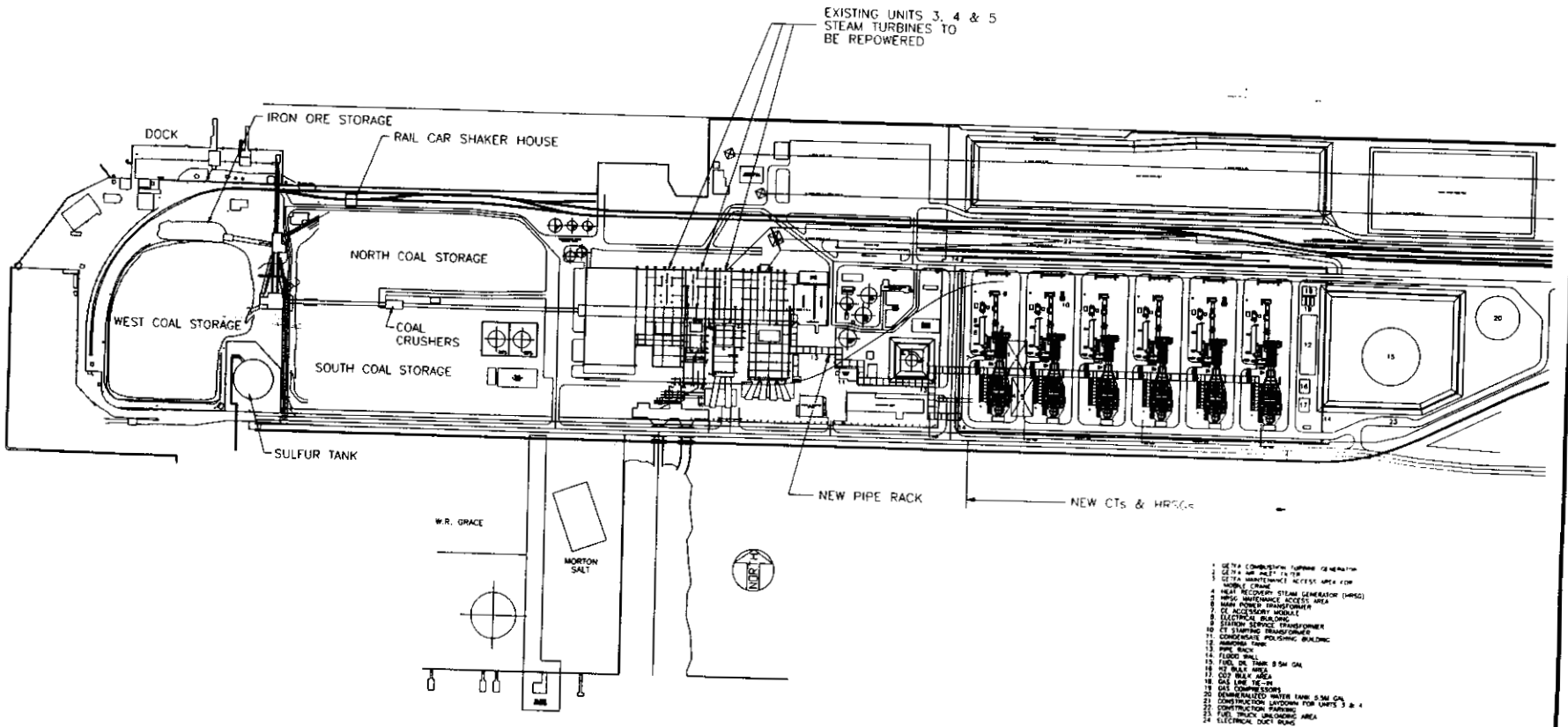
This artist's rendering depicts Tampa Electric's planned 1,475-megawatt Bayside Power Station, following its conversion from coal to natural gas. The rendering is shown from the top of the company's existing Gannon Station power plant facility, which will remain in place. View is looking east, toward U.S. 41 in Tampa.



TAMPA ELECTRIC

GENERAL ARRANGEMENT
EXISTING COAL FIELDS, POWERPLANT,
AND NEW COMBUSTION TURBINES
BAYSIDE POWER STATION

ENERGY SUPPLY - GENERATION ENGINEERING

DRAWN BY:	CHECKED BY	REFERENCE FILE	FILE NAME:	SKETCH NUMBER
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APPROVED BY	DATE	DRAWING SCALE	JOB NUMBER	
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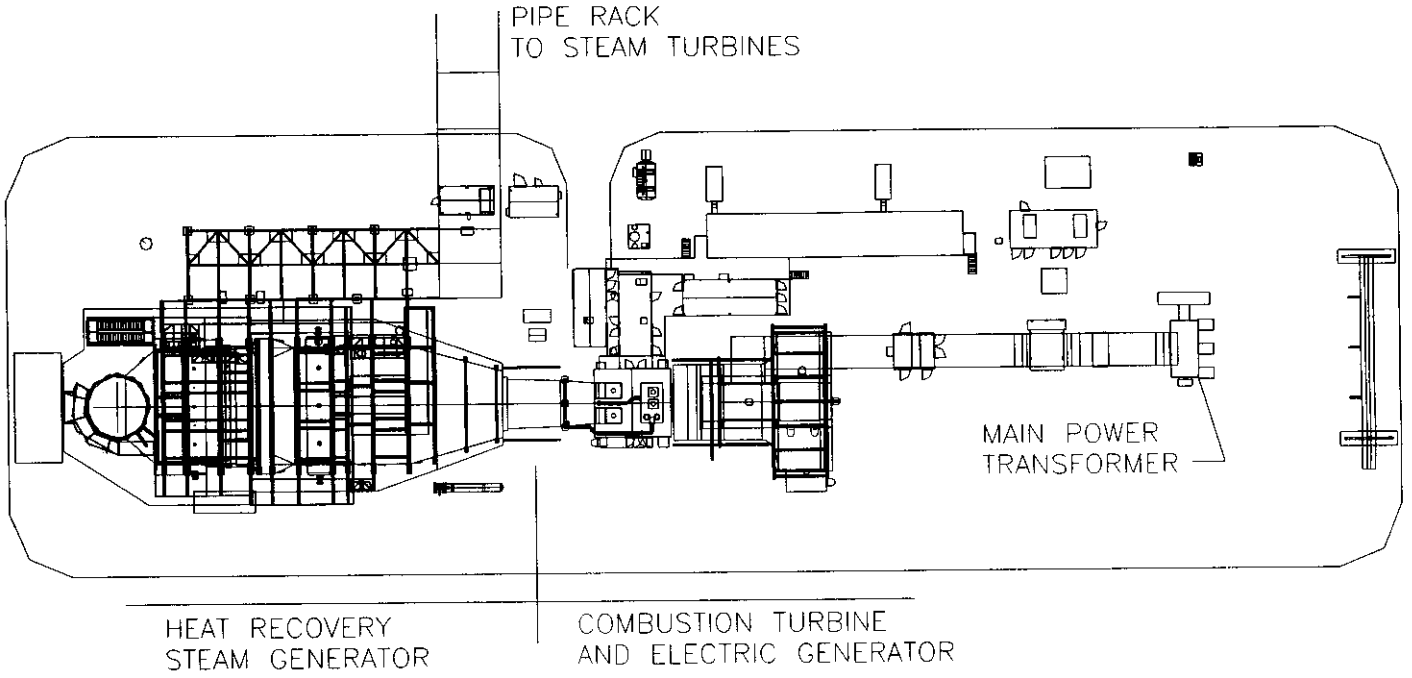
EXHIBIT NO. _____ (CRB-1)
DOCUMENT NO. 2



TECO
TAMPA ELECTRIC

TYPICAL COMBUSTION TURBINE AND
HEAT RECOVERY STEAM GENERATOR
GENERAL ARRANGEMENT
BAYSIDE POWER STATION

ENERGY SUPPLY - GENERATION ENGINEERING

DRAWN BY:	CHECKED BY	REFERENCE FILE	FILE NAME:	SKETCH NUMBER
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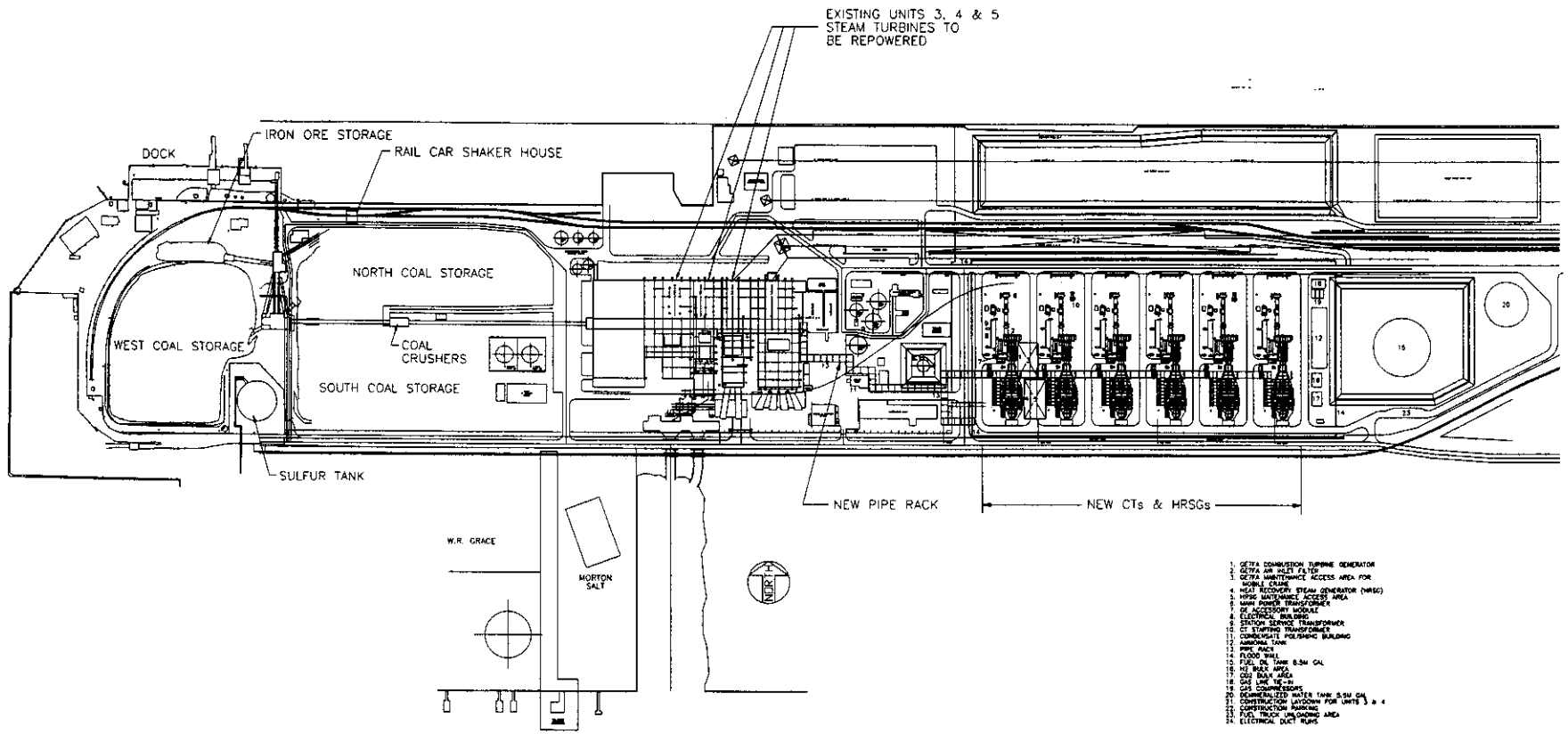

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EXISTING COAL FIELDS, POWERPLANT,
AND NEW COMBUSTION TURBINES
BAYSIDE POWER STATION

ENERGY SUPPLY - GENERATION ENGINEERING				
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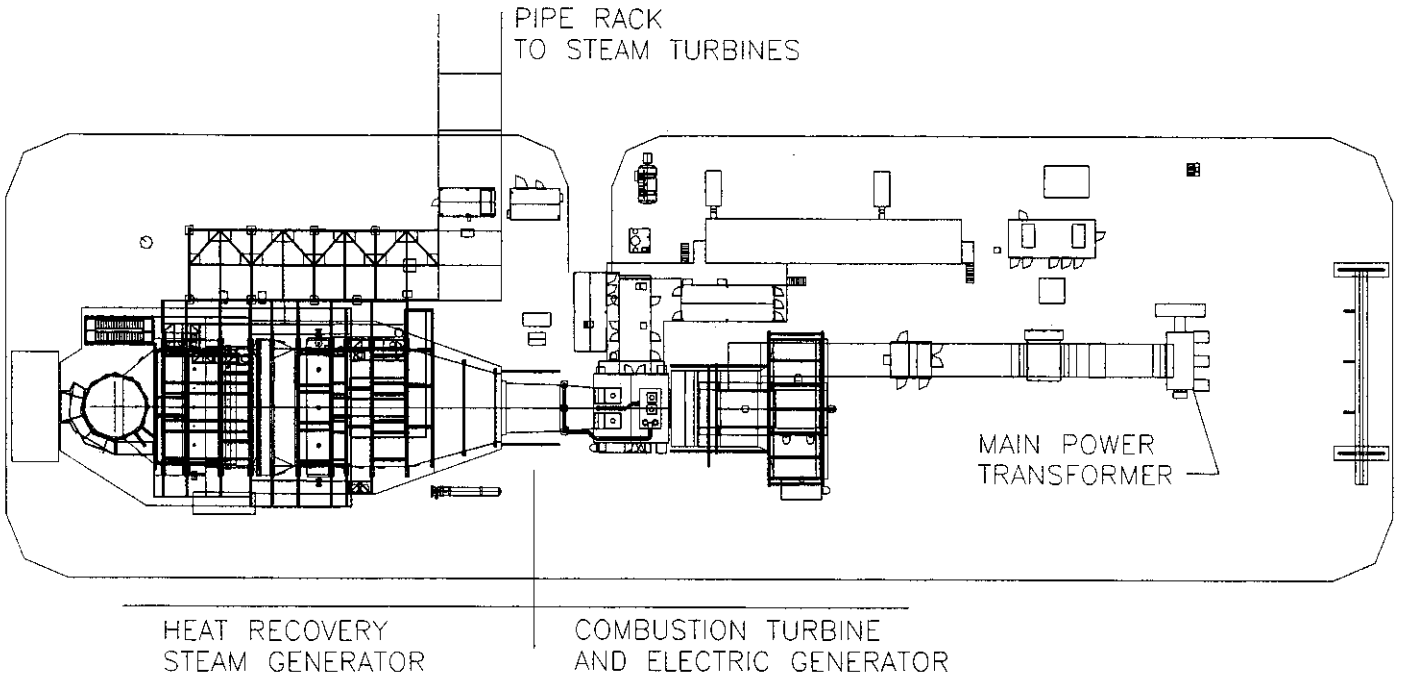

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TYPICAL COMBUSTION TURBINE AND
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GENERAL ARRANGEMENT
BAYSIDE POWER STATION

ENERGY SUPPLY - GENERATION ENGINEERING

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