ORIGINAL

BEFORE THE PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY OF STANLEY A. ARMBRUSTER

ON BEHALF OF

FLORIDA MUNICIPAL POWER AGENCY

DOCKET NO. 050256-EM

APRIL 13, 2005

Q. Please state your name and business address.

A. My name is Stanley A. Armbruster. My business mailing address is 11401 Lamar Avenue, Overland Park, Kansas 66211.

Q. By whom are you employed and in what capacity?

A. I am employed by Black & Veatch as a Project Manager in Black & Veatch's Energy Sector.

Q. Please describe your responsibilities in that position.

A. As a Project Manager, I am responsible for the overall execution and management of a project's engineering, procurement and construction.

Q. Please state your educational background and professional experience.

A. I received a Bachelors of Science in nuclear engineering from Kansas State University in 1974. I am a licensed professional engineer in the following states: Florida, Kansas, New York, and Wisconsin. I previously served as Vice President of Project Development for Black & Veatch Power Development

Corporation (BVPDC), a wholly-owned subsidiary of Black & Veatch. I have over 30 years of experience with Black & Veatch in project management, mechanical power systems design and power plant optimization. Prior to becoming Vice President of Project Development in BVPDC in 1992, I was engineering manager for a large combined cycle project and for the balance-of-plant design of a pumped storage project. I was also a project department engineer on several projects and a member of the Power Conversion Group which performs optimization studies and develops specifications for turbine cycle and heat dissipation systems

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

A. The purpose of my testimony is to describe Treasure Coast Energy Center (TCEC) Unit 1 and to present its projected capital and O&M costs, performance, and schedule.

Q. Are you sponsoring any sections of Exhibit No. __ (FMPA-1), the TCEC Unit 1 Need for Power Application?

A. Yes. I am sponsoring Section 6 and Appendix B of the TCEC Unit 1's Need for Power Application, which were prepared by me or under my direct supervision.

Q. Are there any corrections to Appendix B?

A. Yes, the $521.31/kW cost shown on page 1 of 4 should be the $547.38/kW cost shown on page 4 of 4. On page 1 of 4, the total indirect costs under Other shown as $23,312,860 should be $31,132,495. These corrections do not affect

the total capital cost used in the evaluations. They were merely spreadsheet summation errors.

Q. Please describe TCEC Unit 1.

A. TCEC Unit 1 will be a 1x1 F class combined cycle consisting of one F class combustion turbine, one heat recovery steam generator (HRSG), and one steam turbine. The unit will use a mechanical draft cooling tower using reclaimed water from the Ft. Pierce Utility Authority (FPUA) wastewater treatment plant to be built by FPUA adjacent to the site.

For evaluation purposes in the Need for Power Application, the combustion turbine has been assumed to be a General Electric 7FA. A number of manufacturers supply similar F class combustion turbines. The actual combustion turbine will be selected from a competitive bid process that is currently underway.

TCEC Unit 1 will include a steam turbine designed to accommodate heavy duct firing for additional output. TCEC will have a nominal rating of 300 MW including duct firing and will burn natural gas as the primary fuel with ultra low sulfur diesel (ULSD) fuel oil used as a backup fuel. Natural gas will be delivered through a 3,700 foot lateral from Florida Gas Transmission's (FGT's) natural gas pipeline system. TCEC is located just downstream from an FGT natural gas compressor system; thus gas pressure will be adequate and no onsite gas compressors will be necessary. ULSD oil will be stored onsite in an

approximately one million gallon oil storage tank. The storage tank will be sufficient for approximately three days of full load operation by the combustion turbine. ULSD is planned to be delivered by truck, although an onsite rail spur could be used for ULSD delivery. Operation on oil is expected to be limited to 500 hours per year by the Florida Department of Environmental Protection (FDEP) Prevention of Significant Deterioration (PSD) permit.

TCEC Unit 1 will have full steam bypass to the condenser to allow for combustion turbine operation if the steam turbine is out of service.

Besides the duct firing which allows for rapid load changes in response to system daily load swings, TCEC Unit 1 will be designed to facilitate daily cycling for use in meeting the system daily swings from minimum to peak load. Specific features included in the design of TCEC Unit 1 to facilitate cycling include an auxiliary boiler for use in startup, a lower steam design pressure to allow for a thinner drum and tubes to allow faster heat up, use of full penetration welds, separation of headers, and use of higher strength drum and header materials to enable thinner wall construction to reduce stress from temperature gradients.

Emission controls include the use of dry low NO_x combustors when burning natural gas along with selective catalytic reduction (SCR) to further reduce NO_x. Water injection along with the SCR will be used to control NO_x when burning oil. The use of ULSD will reduce SO_2.

As stated earlier, initially cooling water will be from wells. After the FPUA wastewater treatment facility is operational, cooling water will be reclaimed water. The relatively small service water requirements will be supplied from onsite wells. Wastewater will be returned to the FPUA wastewater plant for treatment and disposal.

TCEC Unit 1 is planned to be interconnected with Florida Power & Light's (FPL's) 230 kV transmission system through two interconnections. One will loop the Plaza-Midway transmission line in and out of the TCEC switchyard and the other will be a radial transmission line to the Midway substation.

The site is being designed for the future addition of three identical generating units. Common facilities such as the 3,700 foot natural gas pipeline lateral will be sized for the ultimate site capacity of 1,200 MW. Ultimate certification for 1,200 MW is being sought under the Florida Electrical Power Plant Siting Act.

A more detailed description of TCEC Unit 1 is presented in Section 6 of Exhibit No. __ (FMPA-1), the TCEC Unit 1 Need for Power Application.

Q. Please describe the construction costs for the TCEC Unit 1.

A. The construction costs include direct costs for purchased equipment and materials, construction contract costs, and indirect costs. The direct construction cost estimate is based on site development for the ultimate capacity and also

sizing interconnecting pipelines for the ultimate capacity. Direct costs include the costs associated with the purchase of equipment, erection, and all contractor services. All direct costs are expressed in November 2004 dollars with escalation to the time of expenditure for May 15, 2008 commercial operation.

Construction costs are based on an engineering, procurement, and construction (EPC), contracting philosophy. Construction is assumed to be performed based on a 50-hour work week, with some 60 hour work weeks. Local labor craft rates are used that includes payroll, payroll taxes and benefits. Construction indirect costs and construction equipment costs are included in the construction and service contracts portion of the estimate.

Indirect costs associated with construction are included in the base cost estimate. General indirect costs include all necessary services required for checkouts, testing services, and commissioning. Insurance for builder's risk and general liability are included. Contractor engineering, contractor field construction management, technical direction, contingency, profit, equipment transportation costs, startup and commissioning are also included.

An allowance of 20 percent of the construction cost estimate is included for Owner's cost based on Black & Veatch's experience with other similar projects. These cost items include the following: permitting and licensing, operational spare parts, transmission system upgrades and interconnections, project development, preliminary engineering, permitting, and legal costs, consultant

engineering and construction management services to act as owner's engineer, rolling stock, initial inventories of furniture, equipment, supplies, consumables, and fuel O&M mobilization, owner's project management and oversight, and owner's contingency.

Interest during construction and other financing fees are not included in the estimate, but are included in the economic evaluations.

Q. What are the projected capital costs for the TCEC Unit 1?

A. The projected capital cost for the TCEC Unit 1 is $217,672,000. The capital cost is summarized in Table 6-3 and the EPC cost is presented in detail in Appendix B of Exhibit No. __ (FMPA-1), the TCEC Unit 1 Need for Power Application.

Q. Have there been any changes to the design of TCEC Unit 1 since the capital cost estimate was developed that would have an impact on the projected capital cost?

A. Yes. There have been several minor changes and a couple of major changes. The $217,672,000 cost estimate included a bypass stack and damper for simple cycle operation instead of full steam bypass to the condenser and an enclosed steam turbine building. The bypass stack and damper and steam turbine building have been removed from the design consistent with Stanton A's design. These changes would result in a reduction of the capital cost by several million

dollars. These cost reductions will be partially offset by site filling requirements that arose in the grading and drainage design.

Q. You mentioned earlier that the competitive bid process for the combustion turbine was currently under way. Have you received combustion turbine bids yet?

A. Yes. We recently received bids.

Q. How did the bids compare to your estimate?

A. The three bids received which are under evaluation compared very favorable with our estimate. They ranged from $6 million less than our estimate to $4.9 million more than our estimate.

Q. Is there contingency in the estimate?

A. Yes. There is $5.9 million contingency in the EPC estimate and an additional $11.3 million contingency in the owners cost.

Q. In your opinion will the actual cost of TCEC Unit 1 less than the estimate?

A. Yes. The scope of the project has been reduced and the estimate includes over $17 million in contingency.

Q. Please provide the estimated performance for TCEC Unit 1.

A. At average conditions of 73 F, full load output and heat rate are expected to be 301,158 kW and 7,437 Btu/kWh, HHV respectively and at extreme conditions

of 100 F, full load output and heat rate are expected to be 291,274 kW and 7,487 Btu/kWh, HHV. Duct burning is assumed for both temperatures. The output assumes 2.7 percent degradation and the heat rate assumes 1.5 percent degradation from new and clean conditions.

Q. Please provide the estimated fixed O&M costs.

A. The estimated fixed O&M costs are $5.90/kW-year in 2004 dollars based on the average output of 301.2 MW. The fixed O&M costs are based on a full time staff of 16. It is planned that FPUA personnel will provide most if not all of the full time personnel at the site.

Q Please provide the estimated variable O&M costs.

A. The estimated variable O&M costs are $3.01/MWh in 2004 dollars based on natural gas operation. The estimated variable O&M costs on ULSD fuel oil are $4.08/MWh in 2004 dollars. The unit is not expected to operate on ULSD except in cases of emergencies. The variable O&M costs are based on 200 starts per year and a 53 percent capacity factor. Actual modeling of the unit in the economic analysis indicates that the number of starts will be less and the capacity factor higher. Both of those factors will reduce the variable O&M costs, so the cost for TCEC Unit 1 will be less and it will be more cost-effective than shown in the economic evaluations.

Q. What is the overall schedule for construction and completion of the project?

A. The schedule is based on having TCEC Unit 1 in commercial operation by May 15, 2008, in order to meet the expected capacity deficit for the summer peak season. The schedule is discussed further in Section 6.7 of Exhibit No. __ (FMPA-1), the TCEC Unit 1 Need for Power Application. Construction is expected to start in August 2006, allowing a little more than 21 months for completion and commercial operation. Preliminary engineering and procurement for long lead items such as the combustion turbine commence during 2005.

Q. Does this conclude your pre-filed testimony?

A. Yes.