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BEFORE THE
OHIO POWER SITING BOARD

In the Matter of the Application of American Municipal Power-Ohio, Inc., for a Certificate of Environmental Compatibility and Public Need for an Electric Generation Station and Related Facilities in Meigs County, Ohio.	))))))	Case No. 06-1358-EL-BGN

DIRECT TESTIMONY OF EVIS COUPPIS

1 Q. Please state your name and business address.

A. My name is Evis C. Couppis. My business address is 1801 California Street, Suite 2800, Denver, Colorado 80202.

2 Q. By whom are you employed, and what is your position?

A. I am employed by R.W. Beck, Inc. ("R.W. Beck) as a Principal and Senior Consultant of Environmental Services.

3 Q. Please describe your duties and responsibilities in that position.

A. As Principal and Senior Consultant I act as the lead environmental consultant for R.W. Beck for environmental services. My responsibilities include organizing and managing a team of environmental engineers and scientists conducting environmental analyses for power and other industrial projects.

4 Q. Please describe your educational background and professional experience.

A. I have a Bachelor of Science degree in Chemical Engineering, a Master of Science degree in Chemical Engineering and a Ph.D degree in Chemical Engineering from the University of Pittsburgh. I am a Registered Professional Engineer. I have performed environmental

studies associated with the permitting and licensing of power generation and transmission facilities throughout the United States, the Caribbean, and the Pacific Rim. My experience with power generation includes coal-, gas- and oil-fired power plants ranging in size up to 3,000 MW, base load and peaking combustion turbines, diesel engines, biomass-fired and municipal solid waste resource recovery facilities.

5 Q. Do you have any professional licenses?

A. Yes.

6 Q. What are they?

A. Professional Engineering License in Colorado and Massachusetts.

7 Q. Are you familiar with AMP-Ohio's Application, as supplemented, for a Certificate of Environmental Compatibility and Public Need for an Electric Generation Station and Related Facilities in Meigs County, Ohio ("Application")?

A. Yes, I am familiar with the AMPGS Application.

8 Q. Are you familiar with the contents of the Application?

A. Yes, generally.

9 Q. Are you familiar with AMP-Ohio's selection of technology for the AMPGS?

A. Yes, R.W. Beck performed a comprehensive feasibility analysis of the AMPGS project for AMP-Ohio.

10 Q. Which technology was selected?

A. Pulverized coal-fired electric generating units utilizing Powerspan air pollution control technology as a part of the facility's pollution control systems.

11 Q. Are you familiar with other technologies that are or could be utilized for base load electric generation in the Midwest?

A. Yes. In addition to pulverized coal ("PC"), the others are nuclear, integrated gasification combined cycle ("IGCC"), natural gas combined cycle (NGCC) and circulating fluidized bed technologies and, under some circumstances, hydroelectric generation.

12 Q. Are you familiar with AMP-Ohio's analysis of those options and the reasons it has chosen pulverized coal-fired electric generating units utilizing Powerspan as a part of AMPGS' pollution control systems?

A. Yes. AMP-Ohio, with input from their consultant Sargent & Lundy among other considerations, evaluated the PC, CFB, NGCC, and IGCC to determine the technology that best met AMP-Ohio's needs and requirements. Nuclear was not evaluated as it was not seen as a viable option at this time.

13 Q. What is R. W. Beck's opinion with respect to the selected technology for the AMPGS Project?

A. Based upon our review, the proposed PC technology to be incorporated into the AMPGS Project is a reliable and proven method of electricity production and the technology selection is reasonable.

14 Q. What are the principal reasons that support that opinion?

A. A number of reasons, including risks, costs, size, reliability, environmental and operating considerations, support the selection of PC for this 1000 MW plant which will provide

for a large portion of AMP-Ohio's Members base load requirements. The other technologies identified do not offer any overall advantages to the PC technology considering AMP-Ohio's needs.

15 Q. Why was IGCC not selected?

A. The IGCC technology (and by this, I refer to IGCC utilized for electrical generation) was not selected for the following reasons:

- The degree of development of the IGCC technology in the United States is not as high as the more conventional PC technology. There are only two units of a size which could be effectively utilized as multiple units in a base load plant to arguably provide the generation capacity required by AMP-Ohio that are operating in the United States, both of which were supported financially by the United States Department of Energy ("DOE") during development and early operation.
- The track record of IGCC technology in the United States indicates lower availabilities than the PC technology. IGCC has approximately a 5% to 8% lower availability than PC technology (i.e., IGCC from 80% to 85% for a single train and PC 88% to 92%). This lower availability is especially evident during the early years of operation.
- The lower availabilities shown by IGCC plants do not match the system characteristics needed by AMP-Ohio. AMP-Ohio does not have any other baseload resources to make up the energy shortfalls from an IGCC unit and would need to resort to purchases from the grid from power plants with higher emissions, utilize expensive backup natural gas fuel at the IGCC plant, or utilize expensive natural gas or diesel peaking generation. Further, IGCC, as a chemical process, cannot be ramped up and down to meet system conditions nearly as quickly as a PC. That is, it is not as dispatchable, another key for AMP-Ohio.
- The level of warranties and guarantees that need to be obtained from EPC contractors and suppliers for IGCC technologies are less certain than warranties and guarantees that could be obtained for PC technologies.
- Even though IGCC may have a small heat rate advantage, the lower availability would necessitate AMP-Ohio purchasing power from the grid to make up this shortfall from power plants with higher heat rates than a new PC technology. Therefore, the apparent

advantage of IGCC is offset by these power purchases from the grid from older, less efficient and less controlled coal units.

- Even when one considers CO_2 capture and sequestration or CCS, which is the reported advantage of IGCC units, the turbine technology to burn hydrogen has not presently been demonstrated by the turbine manufacturers over a time period appropriate for utility application. Ninety percent (90%) capture is defined as the goal of DOE in Future Gen and the capture percentage basis of many of the general projections such as those in the recent 2007 MIT "*The Future of Coal*" study.
- The capital costs of developing an IGCC unit are higher than the costs of PC units by approximately 10 to 20 percent (DOE/NETL – 2007/1281 Report "Cost and Performance Baseline For Fossil Energy Plants"; and EPRI – Clean Coal Technology Status Report February 19, 2007).
- AMP-Ohio is proposing to use the Powerspan technology for SO2 capture. According to Powerspan, this commercially ready technology can subsequently be upgraded to cost effectively capture CO2 at a 90% rate when legislation/regulations are promulgated or it is otherwise appropriate to do so. Powerspan is undertaking CCS demonstration tests in 2008, utilizing a 1 MW slipstream, at the Burger demonstration unit to demonstrate the CO2 capture capability of their process and has other plans for construction of demonstration units at existing power plants. Powerspan and NRG Energy have also announced a 125 MW CCS commercial demonstration at NRG's WA Parish Texas plant to be operational in 2012. The reported Powerspan costs for the CO2 capture are in a similar range as the reported cost for carbon capture from IGCC units (i.e. approximately $20 per ton).
- The overall weight of the evidence and factors identified herein indicates that the IGCC technology does not offer any advantages as compared to the PC technology in terms of meeting the overall objectives of AMP-Ohio.

16 Q. Why didn't AMP-Ohio select natural gas combined cycle?

A. Higher levelized costs and the risk associated with high volatility of natural gas prices, which are projected to rise in the coming years.

17 Q. What about CFB and hydroelectric?

A. I understand AMP-Ohio is aggressively pursuing significant hydroelectric capacity. With regard to CFB a number of disadvantages are noted:

- Unit size for CFB are in the 300 MW range, and as a result more units would be required to satisfy AMP-Ohio's needs
- Capital costs would likely be higher due to the multi-units requirements
- Unit heat rate (Btu/kWh) for a CFB plant is estimated to be 3 to 7 percent higher than the anticipated PC heat rate, resulting in higher fuel costs and higher emissions

18 Q. Are you aware of any currently operating, large electric generation facilities in the United States that are capturing and sequestering carbon dioxide emissions at a commercial scale (± 90% CO2 emissions capture) whether IGCC, PC or some other technology?

A. No.

As the recent study by MIT (*The Future of Coal*, 2007) (which did not, I believe, review Powerspan technology) stated:

> At present Integrated Gasification Combined Cycle (IGCC) is the leading candidate for electricity production with CO_2 capture because it is estimated to have lower cost than pulverized coal with capture; however, neither IGCC nor other coal technologies have been demonstrated with CCS. It is critical that the government RD&D program not fall into the trap of picking a technology "winner," especially at a time when there is great coal combustion and conversion development activity underway in the private sector in both the United States and abroad.

19 Q. Has R.W. Beck done a technology review of Powerspan?

A. Yes. We performed a review of the Powerspan process for SO2 control. During that review, the CO2 capture potential of the process was identified by Powerspan and information presented that indicated Powerspan plans to further test and develop this

capability during 2008 as noted elsewhere. The capture costs identified by Powerspan appear to be in the same magnitude as the reported capture costs from IGCC by various sources including MIT.

22 Q. Please summarize your findings.

A. The key findings are as follows:

- Powerspan has identified the important variables critical in commercializing the ammonia scrubbing process for SO2;
- The ammonia SO2 reaction chemistry has been studied and demonstrated by Powerspan as well as other manufacturers and, therefore, the reaction chemistry is not expected to pose any undue risks to the AMPGS;
- Powerspan has selected partners to engineer, design, and construct the SO2 process that have demonstrated experience in their respective areas of expertise;
- The scale up of the SO2 process from the Burger commercial demonstration unit to the size of the AMPGS is within technical feasibility given the types of equipment involved and the vendor's demonstrated experience with the equipment; and
- The potential for CO_2 capture as a future addition has also been identified by Powerspan and according to Powerspan, is planned to be tested in 2008 at Burger at commercial scale in the NRG WA Parish plant as well.

23 Q. In your view, with specific regard to potential of eventual mandated CCS, would a contemporaneously constructed IGCC facility have advantages over AMPGS as proposed with Powerspan?

A. No.

24 Q. Did AMP-Ohio consider the cost of CO_2?

A. Yes, AMP-Ohio considered the cost of potential CO_2 regulation as a part of its overall planning and feasibility analysis for AMPGS as identified by R. W. Beck during its review of the Powerspan process for SO_2 control.

25 Q. Please explain.

A. The exact economic impact of future CO_2 regulation is impossible to know at this time. AMP-Ohio has given CO_2 regulation careful consideration, and R.W. Beck has developed a stochastic model to project power costs from AMPGS and the wholesale electric market as part of Beck's feasibility study for AMPGS. The stochastic model forecasted numerous alternative future CO_2 values and other uncertain variables such as fuel prices based on past economic behavior. The resulting stochastic projection provided a range of potential project power costs.

R.W. Beck assumed an average cost of $10 per ton of CO_2 (in 2006 dollars), beginning in the 2012 through 2018 timeframe and continuing thereafter. For purposes of the stochastic analysis a range of $5 - $15 per ton (in 2006 dollars) was used. To account for the uncertainity in the timing of CO_2 regulation, a probability was assigned to each year for CO_2 regulation beginning in 2012 until 2018 when a regulatory scheme for CO_2 would likely be fully in place. This range of CO_2 costs was developed in preparation for the AMP-Ohio Power Supply Study in the fall of 2006. The range was based on a review of historical prices in Europe and certain studies and analysis available at that time including a study by the National Commission on Energy Policy (December 2004). The ultimate costs for CO_2 control will be influenced by several factors including the stringency of potential legislation, whether offsets from other sectors of the economy would be allowed to offset emissions from the power industry, the method of regulation (a cap and trade system or a tax), etc.

It is key to note that future CO_2 regulation would have a significant financial impact on the entire wholesale electric market, not just new coal-fired generation. The cost of controlling CO_2 emissions will increase the operating costs of all fossil-fueled plants, including pulverized coal, natural gas combined cycle and simple cycle, and integrated gasification-combined cycle (IGCC) power plants. It will also increase the costs of power purchased in the market. Based on the wholesale electric market price analysis prepared in connection with the feasibility study for AMPGS, R.W. Beck estimated that the market prices in the AEP region where AMPGS is located would increase on average by

approximately $6 to $7 per MWh for every $10 per ton of CO_2 cost over the study period 2013 – 2027.

Even though IGCC has been touted by some as "carbon capture ready" technology, in application at power plants, the application of Powerspan at a PC power plant can also be viewed as being just as "carbon capture ready". The key issue is one of carbon capture costs. Should Powerspan, and IGCC, ultimately prove their respective projections of costs, capture from IGCC and PC plants would be similar and therefore not a distinguishing factor between the technologies.

26 Q. Based on your experience, education, and knowledge of the Application, and in your opinion, does the AMPGS represent the minimum adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives, and other pertinent considerations?

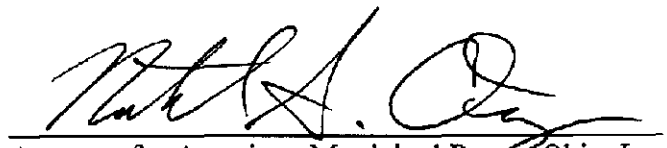
A. Yes.

27 Q. Does this conclude your direct testimony?

A. Yes.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing American Municipal Power-Ohio, Inc.'s Direct Testimony of Evis Couppis, for Case No. 06-1358-EL-BGN was served upon the following parties of record and proposed intervenors via electronic mail and/or via postage prepaid U.S. Mail on December 3, 2007:



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