SOAH DOCKET NO. 582-06-1502
TCEQ DOCKET NO. 2006-0195-AIR

APPLICATION OF OAK GROVE MANAGEMENT COMPANY, LLC FOR PROPOSED AIR PERMIT NO. 76474 AND PSD-TX-1056	**§**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

DIRECT TESTIMONY OF RICHARD FURMAN
ON BEHALF OF PROTESTANT ROBERTSON COUNTY: OUR LAND, OUR LIVES

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I. BACKGROUND AND WORK EXPERIENCE

Q. PLEASE STATE YOUR NAME AND ADDRESS FOR THE RECORD.

A: My name is Richard C. Furman. My address is 10404 S.W. 128 Terrace, Perrine, Florida 33176.

Q: WHAT IS YOUR OCCUPATION?

A: I am a retired consulting engineer, and I volunteer my time to advise utilities, government agencies, environmental groups and the public about the potential benefits of using coal gasification technologies.

Q: HOW LONG HAVE YOU BEEN RETIRED?

A: Since February 2003.

Q: WHAT WAS YOUR OCCUPATION BEFORE YOU RETIRED?

A: During my entire engineering career, I have worked on new energy technologies, alternative fuels for power plants, and pollution control for power plants. Prior to my retirement, I was an independent consulting engineer for 22 years to various utility companies, government agencies, process developers and research organizations on the development, technical feasibility and application of new energy technologies and alternative fuels for power plants.

Q: WHAT, IF ANYTHING, DID YOU DO BEFORE YOU WERE AN INDEPENDENT CONSULTING ENGINEER?

A: Prior to my work as a consulting engineer, I managed Florida Power & Light's coal conversion program and fuels research and development program, which included the first conversion of a 400 megawatt (400MW) power plant from oil to a coal-oil mixture to reduce oil consumption after the second oil embargo.

Prior to this, I directed the engineering study for the conversion of New England Electric's Brayton Point Power Plant, which was the first major conversion of a power plant from oil to coal after the first embargo.

My first engineering job was working for Southern California Edison Company to modify their power plants for two-stage combustion to reduce nitrogen oxide emissions in 1969.

Q: PLEASE SUMMARIZE YOUR FORMAL EDUCATION.

A: I received my B.S. in Chemical Engineering from Worcester Polytechnic Institute in 1969 and a M.S. in Chemical Engineering from Massachusetts Institute of Technology in 1972. I was a researcher at MIT for the book entitled "New Energy Technologies" by Hottel and Howard. After researching for this book, I decided to do my Master's thesis on coal gasification because of its potential as a future energy source and its environmental benefits. My Master's thesis at MIT was entitled "Technical and Economic Evaluation of Coal Gasification Processes".

I was also a teaching assistant at MIT for the courses of “Principles of Combustion and Air Pollution” and “Seminar in Air Pollution Control”.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT’S EXHIBIT P-8. WHAT IS THIS DOCUMENT?

A: It is a true and correct copy of my resume.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS YOUR RESUME UP-TO-DATE AND DOES IT ACCURATELY DESCRIBE YOUR EDUCTION, EXPERIENCE AND TRAINING?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-8.

Q: DID YOUR PAST WORK EXPERIENCE REQUIRE YOU TO HAVE AN IN-DEPTH UNDERSTANDING OF PAST, PRESENT AND NEW FORMS OF ENERGY TECHNOLOGY INCLUDING, BUT NOT LIMITED TO, ENERGY TECHNOLOGIES FOR POWER PLANTS?

A: Yes.

Q: DID YOUR PAST WORK EXPERIENCE REQUIRE YOU TO HAVE AN IN-DEPTH UNDERSTANDING OF COAL GASIFICATION TECHNOLOGIES INCLUDING, BUT NOT LIMITED TO, COAL GASIFICATION TECHNOLOGIES FOR POWER PLANTS?

A: Yes.

Q: DID YOUR PAST WORK EXPERIENCE REQUIRE YOU TO HAVE AN IN-DEPTH UNDERSTANDING OF FUELS FOR POWER PLANTS INCLUDING, BUT NOT LIMITED TO, DIFFERENT TYPES OF COAL SUCH AS LIGNITE OR POWDER RIVER BASIN COALS?

A: Yes.

Q: DID YOUR PAST WORK EXPERIENCE REQUIRE YOU TO HAVE AN IN-DEPTH UNDERSTANDING OF TECHNIQUES FOR CONTROLING POWER PLANT POLLUTION?

A: Yes.

Q: DID YOUR PAST WORK EXPERIENCE REQUIRE YOU TO HAVE AN IN-DEPTH UNDERSTANDING OF THE DEVELOPMENT, TECHNICAL FEASIBILITY AND APPLICATION OF ENERGY TECHNOLOGIES FOR POWER PLANTS?

A: Yes.

Q: DOES YOUR CURRENT VOLUNTEER EXPERIENCE REQUIRE YOU TO KEEP INFORMED OF DEVELOPMENTS TO MAINTAIN YOUR IN-DEPTH UNDERSTANDING OF ALL OF THESE ISSUES (I.E., PAST, PRESENT AND NEW FORMS OF ENERGY TECHNOLOGY; COAL GASIFICATION TECHNOLOGIES; FUELS FOR POWER PLANTS; TECHNIQUES FOR CONTROLING POWER PLANT POLLUTION; AND THE DEVELOPMENT, TECHNICAL FEASIBIILTY AND APPLICATION OF ENERGY TECHNOLOGIES FOR POWER PLANTS?

A: Yes.

PROTESTANT OFFERS RICHARD C. FURMAN AS AN EXPERT IN NEW ENERGY TECHNOLOGIES, COAL GASIFICATION TECHNOLOGIES, FUELS FOR POWER PLANTS, TECHNIQUES FOR CONTROLLING POWER PLANT POLLUTION, AND THE DEVELOPMENT, TECHNICAL FEASIBILITY AND APPLICATION OF ENERGY TECHNOLOGIES FOR POWER PLANTS.

II. SUMMARY OF TESTIMONY

Q: HAVE YOU REVIEWED THE TESTIMONIES FOR THE PROPOSED AIR PERMIT FOR THE OAK GROVE STEAM ELECTRIC STATION (OGSES)?

A: Yes.

Q: HAVE YOU REVIEWED THE PROPOSED PLANT DESIGN INCLUDING THE FUEL CHARACTERISTICS, EMISSIONS AND PROPOSED POLLUTION CONTROL SYSTEMS?

A: Yes.

Q: WHAT IS YOUR EXPERT OPINION ABOUT THE PROPOSED OGSES PLANT DESIGN?

A: There are a number of potential problems that have not been adequately addressed with the proposed design that will cause harm to people and to the environment. For example, the use of Texas lignite combined with the proposed pollution control systems produces excessively high levels of mercury (Hg), nitrogen oxides (NOx), sulfur dioxides (SO2), particulates and carbon dioxide (CO2). There are also the additional risks that the proposed pollution control systems will not be able to reach the estimated control efficiencies because of the reliance upon unproven pollution control technologies.

Q: WHAT DOES THE USE OF TEXAS LIGNITE HAVE TO DO WITH THE HIGH LEVELS OF POLLUTION?

A: The OGSES plant proposes to use Texas Wilcox lignite as its fuel source for the two power boilers. Texas Wilcox lignite has one of the highest mercury concentrations of all the US coals. NOx concentrations from lignite combustion are also relatively high and difficult to remove.

Q: ARE THE PROPOSED EMSISIONS FROM THE OGSES PLANT SIGNIFICANTLY HIGHER THAN OTHER COAL-FIRED PLANTS IN TEXAS? IF SO, EXPLAIN.

A: Yes, the "BACT Summary for Recently Proposed and Permitted Texas Coal-fired Boilers" shows that the OGSES will have significantly higher emission levels for NOx and Hg than the Sandy Creek and City Public Service (CPS) coal-fired power plants which use western coals. The proposed OCSES emission level is 60% higher for NOx and 375% higher for Hg than Sandy Creek and CPS. The proposed OCSES emission level is also 149% higher for Hg than the Alcoa Plant that is also using Texas lignite. These high levels of emissions are an unnecessary health risk for the people in Texas and will cause unnecessary damage to the environment.

Q: ARE YOU AWARE OF ANOTHER EXAMPLE THAT DEMONSTRATES THE PROPOSED EMISSIONS FROM THE OGSES PLANT ARE EXCESSIVELY HIGH? IF SO, EXPLAIN.

A: Yes, the Clean Air Mercury Rule (CAMR) requires that mercury from power plants be capped at 38 tons per year (tpy) in 2010 and 15 tpy in 2018 with the Texas share being 4.657 tpy in 2010 and 1.838 tpy in 2018. The OGSES Plant as proposed will emit 0.72 tpy and will utilize 15% of the total allowance in 2010 and 39% of the total allowance in 2018 for the entire state of Texas. Most states are only reserving 5% to 10% of their Hg allowance for all of their new power plants. If the OGSES plant is permitted as proposed, Texas will be using 15% to 39% of its total Hg allowance for just one power plant; however, the OGSES plant will add only about 2% to the total generating capacity in Texas.

Q: PLEASE EXPLAIN FURTHER YOUR STATEMENT THAT "THERE ARE ALSO THE ADDITIONAL RISKS THAT THE PROPOSED POLLUTION CONTROL SYSTEMS WILL NOT BE ABLE TO REACH ESTIMATED CONTROL EFFICIENCIES BECAUSE OF THE RELIANCE UPON UNPROVEN POLLUTION CONTROL TECHNOLOGIES."

A: The OGSES proposed air pollution control systems have <u>not</u> been demonstrated at commercial scale with lignite fuel for NOx and Hg (mercury). A recent EPRI Journal article titled "Mercury Control for Coal-Fired Power Plants", Summer 2005, page 19 states**:**

> **"No technology designed specifically to control mercury in coal plants is in use anywhere in the world, or has even undergone long term testing."**

The small scale testing with lignite that has been conducted with the proposed pollution control systems for NOx and mercury indicate that significant problems need to be overcome in order to meet the proposed emission standards.

The already high levels of emissions from the proposed OGSES plant can only be obtained if: 1) problems with the pollution control systems operating with Texas lignite can be overcome; 2) these systems can be successfully scaled-up to commercial sizes; and 3) the additional costs for these systems are economically feasible.

Therefore, there are the additional risks that these plants will not be allowed to operate, will operate at excessively high emission rates or will be too costly to operate. Good engineering practice would indicate that these risks are not acceptable.

III. COMMERCIALLY AVAILABLE TECHNOLOGY EXISTS THAT WILL PRODUCE SIGNIFICANTLY LOWER EMISSIONS THAN THE PROPOSED PC COMBUSTION

Q: IS THERE ANY COMMERCIALLY AVAILABLE TECHNOLOGY THAT HAS DEMONSTRATED SIGNIFICANTLY LOWER EMISSIONS OF MERCURY, NOx, PARTICULATES AND CO2 WITH LIGNITE COALS?

A: Yes.

Q: WHAT IS THIS CONTROL TECHNOLOGY?

A: Intergrated Gasification Combined Cycle (IGCC) power plants and coal gasification plants (CGP) that produce fuels and chemicals have been operating successfully for over 10 years and have proven that Hg, NOx, particulates and CO2 can be economically controlled to very low emission levels.

Q: PLEASE BRIEFLY EXPLAIN THE PROCESS OF USING LIGNITE COAL FOR AN INTERGRATED GASIFICATION COMBINED CYCLE (IGCC) POWER PLANT AND A COAL GASIFICATION PLANT (CGP) INCLUDING WHAT MAY HAPPEN WITH THE RESULTING BYPRODUCTS AND POLLUTANTS.

A: In an IGCC plant, a gasifier converts any hydrocarbon such as lignite coal into gaseous components by applying heat under pressure in the presence of steam and oxygen. A gasifier differs from a combustor in the amount of air or oxygen available inside the gasifier which is carefully controlled so that only a small portion of the fuel burns completely. This partial oxidation process provides the heat. Rather than burning, most of the carbon-containing feedstock is chemically broken apart by the gasifier's heat and pressure to produce the synthesis gas. Synthesis gas or syngas is primarily hydrogen, carbon monoxide and other gaseous constituents, the proportions of which can vary depending upon the conditions in the gasifier and the type of feedstock. Minerals in the fuel separate and leave the bottom of the gasifier either as an inert glass-like slag or other marketable solid products. Only a small fraction of the mineral matter is blown out of the gasifier as fly ash and requires removal downstream. Sulfur impurities in the feedstock form hydrogen sulfide, from which sulfur is easily extracted, typically as elemental sulfur or sulfuric acid, both valuable byproducts. Nitrogen oxides, another potential

pollutant, are not formed in the oxygen-deficient (reducing) environment of the gasifier. Instead, ammonia is created by the nitrogen-hydrogen reactions. The ammonia can be easily stripped out of the gas stream.

In integrated gasification combined-cycle (IGCC) systems, the syngas is cleaned of its hydrogen sulfide, ammonia and particulate matter and is burned as fuel in a combustion turbine to produce electricity. The exhaust heat from the combustion turbine is recovered and used to create steam for a steam turbine which is used to generate additional electricity. The use of these two types of turbines - a combustion turbine and a steam turbine - in combination is known as a combined-cycle. By integrating the gasification and combined-cycle power systems unprecedented power generation efficiencies can be achieved. Currently, gasification-based systems can operate at about 42% efficiency. In the future, these systems may be able to achieve efficiencies approaching 60%. A new super-critical pulverized coal plant, by contrast, employs only a steam turbine-generator and is typically limited to about 38% efficiency. Higher efficiencies mean that less fuel is used to generate the rated power, resulting in better economics (which can mean lower costs to ratepayers) and the emission of less pollutants.

In Coal Gasification Plants (CGP) all or part of the clean syngas can also be used in other ways such as chemical building blocks to produce a broad range of liquid or gaseous fuels and chemicals. This is possible by using processes that are well established in today's chemical industry. This syngas can also be further processed to produce the hydrogen that is needed for refineries, fuel-cells and the power plants of the future (Future-Gen). Another advantage of gasification-based energy systems is that when oxygen is used in the gasifier (rather than air), the carbon dioxide produced by the process is in a concentrated gas stream, making it much easier and less expensive to separate, use and sequester.

Q: ARE YOU AWARE OF EXAMPLES THAT DEMONSTRATE THE COMMERCIAL SIZE OF IGCC AND COAL GASIFICATION PLANTS AND THEIR ABILITIY TO CONTROL EMISSIONS? IF SO, PLEASE DISCUSS.

A: Yes, the Great Plains Synfuels Plant in Beulah, North Dakota is a good example of a lignite-fired gasification plant. It began operating on lignite in 1984 and today produces more than 54 billion cubic feet of natural gas from 6 million tons of lignite per year.

Adjacent to the Great Plains Synfuels Plant is the Antelope Valley Station which consists of two 440 MW lignite coal power plants that also started operation on lignite in the early 1980s.

Both plants are owned by the Basin Electric Power Cooperative. Al Lukes, Senior Vice President and COO of the Dakota Gasification Company, recently presented a paper at the 2005 Gasification Technologies Conference entitled “Experience with Gasifying Low Rank Coals” which showed the significantly lower emissions from the lignite-fired gasification plant than the lignite-fired power plant. I recently asked Al Lukes which technology he would select today for a power plant, and he said **“definitely the gasification technology”.**

Q: CAN ADDITIONAL TECHNOLOGIES BE ADDED TO MAKE BETTER USE OF THE EMISSIONS RATHER THAN JUST RELEASING THEM INTO THE AIR? IF SO, PLEASE EXPLAIN.

A: Yes, in 2000, the Great Plains Synfuels Plant (the lignite gasification plant) added a CO2 recovery process to capture the CO2. It transports the CO2 by pipeline 200 miles to the Weyburn oil fields where it is used for enhanced oil recovery (EOR). In this way, the CO2 does not become a global warming emission source but is sold as a useful byproduct to recover additional oil from depleted oil fields and the CO2 is sequestered underground. This CO2 recovery process is expected to help extract 130 million extra barrels of oil from this oil field. This demonstrates the ability to use lignite coals in the gasification process and to efficiently recover and use the CO2.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-9. WHAT IS THIS DOCUMENT?

A: It is an excerpt from the book "The New Synfuels Energy Pioneers" by Stan Stelter, Introduction by Former President Jimmy Carter, published by Dakota Gasification Co., a subsidiary of Basin Electric Power Cooperative, page 48. It shows the Great Plains Synfuels Plant and Antelope Valley Station in North Dakota.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-9.

Q: DO YOU HAVE ANOTHER EXAMPLE? IF SO, PLEASE EXPLAIN.

A: Yes, another example is the Coal Gasification Plant (CGP) of the Eastman Chemical Company in Kingsport, Tennessee. It has been operating on a commercial scale for over 20 years. This plant uses activated carbon beds for removing more than 94% of the mercury from the synthesis gas.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-10. WHAT IS THIS DOCUMENT?

A: It is an excerpt from "Coal Gasification – When Does It Make Sense?" presented at Power-Gen International 2005, in Las Vegas, Nevada by Bill Trapp, Eastman Gasification Services Manager, page 25. It shows the Coal Gasification Plant (CGP) of Eastman Chemical Company in Kingsport, Tennessee.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-10.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-11. WHAT IS THIS DOCUMENT?

A: It is an excerpt from "Coal Gasification – When Does It Make Sense?" presented at Power-Gen International 2005, in Las Vegas, Nevada by Bill Trapp, Eastman Gasification Services Manager, page 7. It shows the activated carbon beds used at the Coal Gasification Plant (CGP) of Eastman Chemical Company in Kingsport, Tennessee that have been in commercial operation for over 20 years and which remove over 94% of the mercury.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-11.

Q: CAN YOU GIVE EXAMPLES OF OTHER EXISTING COMMERCIAL SCALE COAL BASED IGCC PLANTS? IF SO, PLEASE DISCUSS.

A: Yes. Examples include four IGCC plants: Wabash in Indiana, Polk in Florida, Puertollano in Spain and Buggernum in the Netherlands. These plants have been operating from 9 to 12 years. They have successfully integrated the gasification process with the combined cycle power plant to enable more efficient use of coal while significantly reducing emissions.

Q: WHAT ARE THE SIZES OF THESE PLANTS?

A: These plants range in size from 250 to 318 MW per unit.

Q: COULD THE SAME TECHNOLOGIES BE USED FOR A LARGER PLANT? IF SO, PLEASE EXPLAIN.

A: Yes, for larger size plants multiple units can be used which will improve system availability and reduce costs by making use of standard, modular designs.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-12. WHAT IS THIS DOCUMENT?

A: It is an excerpt from the "Gasification Combined Cycles 101" an EPRI Presentation by Dr. Jeffrey Phillips, March 2, 2006, page 22 at the Workshop on Gasification Technologies in Tampa, Florida. It shows pictures of the four existing commercial scale coal-based IGCC plants previously discussed.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-12.

Q: ARE THERE A NUMBER OF PLANTS THAT GASIFY COAL? IF SO, PLEASE EXPLAIN.

A: Yes, a 2004 survey of operating gasification plants indicates that there are a significant number of plants that gasify coal and a significant number that produce electric power. Specifically, the survey showed 117 operating plants consisting of 385 gasifiers and a capacity of approximately 45,000 megawatts thermal.

Additionally, I have a chart listing the top 30 operating commercial gasification projects. For example, the Sasol II and Sasol III plants in South Afica are ranked as the number one and two largest commercial gasification projects and both use subbituminous coal. These plants have been operating since 1977 and 1982 respectively. Also, the Dakota Gasification Co. (which operates the Great Plains Synfuels Plant) is ranked number four and uses lignite. These three plants have an output of 4130, 4130 and 1545 megawatts thermal respectively.

This chart provides the size of these plants and shows the use of lignite and other low rank coals for the largest of these plants. What is remarkable about this chart is that three of the four largest plants in the world are running on low rank coals.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-13. WHAT IS THIS DOCUMENT?

A: It is an excerpt from the "Gasification: The Enabling Technology," presented by James Childress, Executive Director of the Gasification Technologies Council, presented at PowerGen International, MegaSession, Intergrated Gasification Combined Cycle, on December 8, 2005, page 4. It is a chart summarizing the 2004 operating plant statistics.

Q: DID YOU PREPARE THE EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-13.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-14. WHAT IS THIS DOCUMENT?

A: It is an excerpt from a DOE Report by SFA Pacific "Gasification – Worldwide Use and Acceptance", January 2000, page 7. It is the chart listing the largest 30 operating commercial gasification plants that I previously discussed.

Q: DID YOU PREPARE THE EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS PROTESTANT'S EXHIBIT P-14.

Q: ARE MORE GASIFICATION PLANTS EXPECTED TO BE BUILT? IF SO, PLEASE EXPLAIN.

A: Yes, there were at least twenty-four (24) gasification plants being planned in the United States before the passage of the Energy Policy Act (EPACT) of 2005. Most of these planned plants are IGCC plants.

Q: WHAT ROLE, IF ANY, DOES THE PASSAGE OF THE ENERGY POLICY ACT (EPACT) OF 2005 HAVE ON THIS MATTER?

A: The Energy Policy Act (EPACT) of 2005 provides additional economic incentives to companies to build gasification plants.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-15. WHAT IS THIS DOCUMENT?

A: It is an excerpt from the "Gasification: The Enabling Technology," presented by James Childress, Executive Director of the Gasification Technologies Council, presented at PowerGen International, MegaSession, Intergrated Gasification Combined Cycle, on December 8, 2005, page 16. It is a chart identifying the 24 pre-EPACT planned U.S. gasification plants.

Q: DID YOU PREPARE THE EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS PROTESTANT'S EXHIBIT P-15.

IV. THE OGSES PROPOSED PC COMBUSTION TECHNOLOGY RESULTS IN SIGNIFICANTLY HIGHER EMISSIONS COMPARED TO OTHER COMMERCIALLY AVAILABLE TECHNOLOGIES

Q: HOW DO EMISSIONS FROM AN IGCC PLANT COMPARE WITH VARIOUS TYPES OF COAL AND NATURAL GAS-FIRED POWER PLANTS?

A: Numerous studies and commercial plant data show that there are significantly lower emissions of all pollutants and less water usage for an IGCC plant than Pulverized Coal (PC) plants. The emissions from an IGCC plant are almost as low as the emissions from a Natural Gas Combined Cycle (NGCC) plant

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-16. WHAT IS THIS DOCUMENT?

A: It is an excerpt from "Coal Gasification – When Does It Make Sense?" presented at Power-Gen International 2005, in Las Vegas, Nevada by Bill Trapp, Eastman Gasification Services Manager, page 30. It is a chart of typical power plant emissions by technology type. It shows the much lower emissions of all the pollutants for IGCC versus PC combustion and the lower costs for mercury and CO2 removal.

Q: DID YOU PREPARE THE EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-16.

Q: HOW DO EMISSIONS FROM AN IGCC PLANT COMPARE WITH A SUPERCRITICAL PULVERIZED COAL POWER PLANT?

A: A comparision of the permit emission data that has been submitted for a supercritical pulverized coal (SCPC) power plant in Wisconsin compared with an intergrated gasification combined cycle (IGCC) power plant in Wisconsin using the same coal shows that the IGCC plant reduces NOx by 25%, SO2 by 72%, mercury by 67%, PM10 by 58% and CO by 82%.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-17. WHAT IS THIS DOCUMENT?

A: It is an excerpt from the "Gasification: The Enabling Technology," presented by James Childress, Executive Director of the Gasification Technologies Council, presented at PowerGen International, MegaSession, Intergrated Gasification Combined Cycle, on December 8, 2005, page 10. This table compares the permit emission data that has been submitted for a supercritical pulverized coal (SCPC) power plant in Wisconsin with an intergrated gasification combined cycle (IGCC) power plant in Wisconsin using the same coal. The IGCC plant reduces NOx by 25%, SO2 by 72%, mercury by 67%, PM10 by 58% and CO by 82%.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-17.

Q: WHAT ARE THE AMOUNTS OF ADDITIONAL EMISSIONS FOR THE OGSES PLANT BY CHOOSING TO USE THE PROPOSED PC COMBUSTION VERSUS IGCC?

A: The emissions of mercury using the proposed PC combustion are 6.4 times the emissions if IGCC is used. The emissions of NOx using the proposed PC combustion are 1.4 times the emissions if IGCC is used. The emissions of SO2 using the proposed PC combustion are 3.6 times the emissions if IGCC is used. The emissions of particulate using the proposed PC combustion are 2.1 times the emissions if IGCC is used.

Q: HOW DID YOU REACH THE ABOVE CONCLUSIONS?

A: I obtained the proposed PC emissions from "Table B-2 Power Boiler Emission Calculations, OGSES, Oak Grove Management Company LP, Revised 12/16/05". I then calculated the IGCC emissions by using the emission factors from Exhibit P-16 for the IGCC case with the highest emission factors. Then I divided the proposed PC emissions by the possible IGCC emissions. The following chart summarizing my findings:

Control Technology	Hg lb/yr	NOx tons/yr	SO2 tons/yr	Particulate tons/yr
PC Combustion	1,440	6,286	15,067	1,178
IGCC	224	4,478	4,165	550
PC Combustion	6.4	1.4	3.6	2.1

IGCC

Q: HOW IS GASIFICATION TECHNOLOGY ABLE TO OBTAIN SUCH SIGNIFICANTLY LOWER EMISSIONS THAN PC COMBUSTION TECHNOLOGY?

A: Both combustion and gasification involve the reaction of coal with oxygen. The differences between combustion and gasification are the temperatures, pressures and concentrations of oxygen that exist during these reactions. In typical PC combustion, coal reacts with the oxygen in air at about 1800 F and at atmospheric pressure (14.7 psi). In IGCC, the coal reacts with more concentrated oxygen that has been separated from the air. In the typical IGCC process, the reaction is controlled at about 2600 F and about 600 psi.

These differences in the reaction conditions between combustion and gasification create the conditions to enable the enhanced removal of the pollutants in coal. Since gasification occurs at a higher pressure, the volume of gas that is produced is much smaller. Since air is 79% nitrogen and only 21% oxygen, the removal of the nitrogen significantly reduces the volume of gas that is produced even more.

This makes the volume of gas that requires pollution control treatment to be 160 times smaller for the IGCC process than the PC combustion process. This much smaller volume of gas is also much more concentrated which enables much greater removal efficiency for all of the pollutants.

The removal of the nitrogen from air in the IGCC process has the additional benefit of significantly reducing the production of NOx. Since the nitrogen concentration is very low and there is no excess oxygen in gasification, very little NOx is produced. The nitrogen that is removed from the air is actually used in the combustion turbine to reduce temperatures and further reduce NOx emissions.

Since there is no excess oxygen in gasification, the sulfur in the coal reacts to become H2S and COS which are much easier to remove than SO2 and can be recovered as useful sulfur or sulfuric acid byproducts. The higher removal efficiencies for these sulfur compounds produce the much lower SO2 emissions for gasification.

V. COST BENEFITS OF IGCC OVER PC COMBUSTION TECHNOLOGY

Q: ARE THERE COST BENEFITS OF IGCC COMPARED TO PC COMBUSTION TECHNOLOGY? IF SO, EXPLAIN.

A: Yes, cost benefits of IGCC compared to PC combustion technology exists. For example, the gasification reactions produce a synthesis gas consisting of mainly CO and H2 which can be used as the fuel for a combined cycle power plant, as the building blocks for various chemicals and as a raw material for producing alternative fuels. Since this synthesis gas is 0.006 of the volume of the flue gas from PC combustion, it is more efficient and less costly to remove other pollutants such as CO2.

Also, the higher reaction temperature for gasification also has a benefit because coal ash has a softening temperature of about 2250 F. Therefore, the coal ash goes through a molten state when gasified then cools to become an inert, vitrified slag that can be sold as a byproduct or disposed of as a non-leachable material.

Q: ARE YOU AWARE OF OTHER COST BENEFITS OF IGCC OVER PC COMBUSTION? IF SO, PLEASE EXPLAIN.

A: Yes, there are other cost benefits to consider. The proposed OGSES plant will have a long operating life. Other electric generating utility companies take this into consideration when planning new plants.

For example, American Electric Power (AEP) is the largest electric generating utility in the U.S. and the largest coal-burning utility in the U.S. In a speech before the National Coal Council in Washington D.C. on December 13, 2005, Michael Morris, President and CEO of AEP, stated the reasons why AEP decided to use IGCC technology to remove pollutants.

Mr. Morris explains that when you plan for a new power plant that has a 40 year life you must consider the future environmental regulations that this plant will be required to meet. Those future environmental regulations will include greenhouse gas emissions (CO2) in addition to more stringent emission standards for Hg, NOx and SO2. Therefore Mr. Morris said,

"we are absolutely convinced that gasification technology is the right way to use coal".

AEP's economic analysis of PC combustion versus IGCC includes a cost and probability of CO2 removal requirements in the future. When these costs and the probability of these CO2 emission standards happening are included in the economic analysis IGCC provides the lowest cost of electricity.

Q: BASED UPON YOUR PROFESSIONAL EXPERTISE, DO YOU AGREE WITH THE STATEMENTS MADE BY MR. MORRIS?

A: Yes.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-18. WHAT IS THIS DOCUMENT?

A: It is an excerpt of the transcript of the speech of Mr. Morris before the National Coal Council in Washington D.C. on December 13, 2005.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-18.

Q: HOW DOES THE COST OF MERCURY REMOVAL COMPARE BETWEEN A COAL GASIFICATION PLANT VERSES A PULVERIZED COAL PLANT?

A: A recent DOE report by Parsons Infrastructure and Technology Group Inc. entitled "The Cost of Mercury Removal in an IGCC Plant, Final Report, September 2002" shows that the cost of mercury removal from a pulverized coal plant is almost 10 times the cost of mercury removal from an IGCC plant. The Summary of this DOE Report states**:**

> **"Mercury has been identified by EPA as the toxic substance of greatest concern among all of the air toxics emitted from power plants. … Meeting these regulatory requirements without excessive costs is a significant concern. Integrated gasification combined cycle (IGCC) plants offer the capability of removing the mercury … Currently, there is no single proven technology that can uniformly control mercury from power plant flue gas in a cost-effective manner ... The costs for mercury removal in PC plants can be an order of magnitude higher than the removal costs in an IGCC plant."**

Q: BASED UPON YOUR PROFESSIONAL EXPERTISE, DO YOU AGREE WITH THE CONCLUSION REACHED IN THE DOE REPORT?

A: Yes.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-19. WHAT IS THIS DOCUMENT?

A: It is an excerpt from the "Eastman Gasification Overview" dated March 22, 2005, page 36. The document can be found online at: www.eastman.com/publicdocs/Gasification/Eastman_Gasification_Overview. It summarizes the results from Parsons' DOE report about the cost of mercury removal in an IGCC plant.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-19.

VI. THE PROPOSED PC COMBUSTION TECHNOLOGY HAS GREATER RISKS ASSOCIATED WITH IT THAN OTHER AVAILABLE TECHNOLOGIES

Q: ARE THERE RISKS INVOLVED IN USING THE PC COMBUSTION TECHNOLOGY OR THE IGCC TECHNOLOGY? IF SO, PLEASE GIVE AND EXPLAIN YOUR OPINION AS TO WHICH TECHNOLOGY CARRIES THE GREATER RISK.

A: Yes, there are risks involved in both technologies. The risks to public health, to the environment and to the cost of electricity are far greater if the proposed PC combustion technology is used. There is the substantial risk that the proposed pollution control systems will

not be able to meet the proposed permit limits. Also, the risks to public health and the environment are much greater because if the proposed pollution control systems are working properly the emissions will still be significantly higher than with IGCC technology. The following describes why, in my opinion, the risks to the public health, the environment and the cost of electricity are much less by using the IGCC technology.

Added risks associated with the proposed OGSES control system for Hg are due to the following:

1. Texas Wilcox lignite has one of the highest mercury concentrations of all the U.S. coals.
2. The chemical composition of the mercury in this lignite makes it very difficult for existing control technologies to remove this mercury.
3. No technology presently exists at the commercial scale to effectively control the mercury from this coal.
4. Therefore DOE is funding a major R&D program to develop a mercury control technology for both lignite and other western coals.
5. There are the risks that an effective mercury control technology will not be developed in time, will not be scaleable to commercial size and will not be cost effective.

Even if all of these problems can be successfully overcome, the proposed OGSES will still have the highest emissions of mercury of any new power plant being proposed to be built in the U.S.

In addition to mercury, added risks associated with the proposed system for NOx are due to the following:

1. There is no commercial experience using Selective Catalytic Reduction (SCR) with lignite.
2. The low volatility of this lignite interferes with the capability of the low NOx burners and overfire air systems to control the generation of NOx in the boilers. Therefore high levels of NOx are produced in the boilers.
3. The ash quantities and ash composition of this lignite create serious catalyst fouling problems and therefore limits the performance of the SCR system to reduce the high NOx emissions.
4. Therefore additional R&D, pilot plant and commercial scale testing are required to develop an effective NOx control system for lignite.
5. There are the risks that an effective NOx control technology will not be developed in time, will not be scaleable to commercial size and will not be cost effective.

When we look at the risks to the public health and to the environment we need to realize that in the IGCC process the coal is converted to a gas and the pollutants are removed first before the fuel is used in the combined cycle power plant. If most of the pollutants are not removed from the gas, the gas will not be of acceptable quality to be used in the combustion turbine without causing damage to the turbine. This provides an additional check that most of the

pollutants have been removed in the IGCC process. If the gasification portion of the plant that is producing and cleaning the gas is not operating properly, it is still possible to generate electricity by using either natural gas or diesel fuel. Therefore, there will not be any risk to the public health or the environment if the gasification portion of the plant is not operating properly.

The only risk with an IGCC plant is the cost difference between these alternative fuels and coal if the gasification portion of the plant is not operating properly. When the IGCC plant is operating on any of its fuels (coal, natural gas or fuel oil) it will be able to provide significantly lower emissions than the proposed PC combustion technology.

VII. THE FUTURE BENEFITS AND ECONOMIC ADVANTAGES OF USING GASIFICATION TECHNOLOGIES.

Q. HOW DOES THE FUTURE REQUIREMENT TO MEET CO2 REDUCTIONS IMPACT THE COST OF ELECTRICITY FOR IGCC PLANTS AND PC PLANTS?

A. Studies performed by the Electric Power Research Institute (EPRI), American Electric Power (AEP) and others all show that IGCC is more cost effective than pulverized coal if carbon reductions are required. The use of a cost for carbon emissions in planning is reasonable given the high likelihood that carbon will be regulated in the future. A recent EPRI study shows the cost of electricity (COE) for both IGCC plants and PC plants in 2020. The study demonstrates that at any carbon cost, IGCC will provide the lowest cost of electricity. It further shows the most reasonable approach to obtain the lowest COE during the entire life of the plant is to build an IGCC plant with CO2 capture capability. This is why Mr. Michael Morris, President and CEO of AEP, explained that when you plan for a new power plant that has a 40 year life you must consider the future environmental regulations that this plant will be required to meet. Those future environmental regulations will include greenhouse gas emissions (CO2) in addition to more stringent emission standards for Hg, NOx and SO2. Therefore Mr. Morris said,

"we are absolutely convinced that gasification technology is the right way to use coal".

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-20. WHAT IS THIS DOCUMENT?

A: It is an excerpt from the EPRI Presentation – "Gasification Combined Cycles 101" by Dr. Jeffrey Phillips, page 22, presented at the Workshop on Gasification Technologies, Tampa, FL 3/2/06. It shows the results of a recent EPRI study showing the cost of electricity in 2020 from an IGCC plant and a PC plant by comparing the COE for plants designed with the capability to remove CO2 and plants that will pay the CO2 allowance. It demonstrates that at any carbon cost IGCC will provide the lowest cost of electricity.

Q: DID YOU ATTEND THIS PRESENTATION?

A: Yes.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-20.

Q: ARE THERE ECONOMIC EVALUATIONS THAT HAVE BEEN CONDUCTED SPECIFICALLY FOR THE GASIFICATION OF TEXAS LIGNITE? PLEASE EXPLAIN YOUR RESPONSE.

A: Yes. A recent DOE report entitled "Polygeneration of SNG, Hydrogen, Power and Carbon Dioxide from Texas Lignite" by Mitretek , December, 2004, is a good example of the economic opportunities that presently exist to use Texas lignite and protect the public health and the environment.

Q: PLEASE SUMMARIZE YOUR FINDINGS CONCERNING THIS REPORT.

A: The purpose of this study was to investigate the feasibility of siting a lignite gasification plant in Texas at the mine mouth of the Wilcox lignite deposit. The concept is to co-produce at least three products: electric power, hydrogen or synthetic natural gas (SNG), and carbon dioxide. The electric power is to be sold to the grid, the hydrogen is to be sent by pipeline to the Gulf Coast petroleum refineries, the SNG is to be sold as a natural gas supplement, and the carbon dioxide is to be pipelined to the West Texas oil fields for enhanced oil recovery (EOR).

For this study, the coal gasification plant (CGP) is sited in Texas at a mine mouth location above the Wilcox lignite seam. This is shown in Exhibit 15. The Texas site was selected because it fulfilled all major requirements. It is roughly 340 miles from the West Texas oil fields, 20 miles from interstate natural gas pipelines that run to the U.S. East Coast and Midwest, and 180 miles from the existing U.S. gulf coast hydrogen pipeline. In addition, electric power is already produced at mine mouth locations along the seam.

Since multiple products are produced from each of the two configurations, the product price for electricity was set at 3.56 cents/ KWH and the price for carbon dioxide was set at $12 / ton. Then the required sales price (RSP) for the SNG or hydrogen was calculated to provide the necessary 15% return on equity (ROE). The economic analysis in this report investigated two polygeneration configurations. The first of these used Texas lignite to produce electric power, SNG, and carbon dioxide in a polygeneration facility. The second polygeneraion configuration used the Texas lignite to produce electric power, hydrogen, and carbon dioxide. Seven gasification systems were examined to convert the lignite into synthesis gas.

Q: DOES YOUR REVIEW OF THIS STUDY ALLOW YOU TO PROVIDE COST COMPARISONS TO RECENT ENERGY PRICES?

A: Yes.

Q: PLEASE PROVIDE THIS COST COMPARISON.

A: The following table compares the polygeneration product costs for SNG and hydrogen with recent prices. The range of values shown in the following table for polygenerated SNG and hydrogen is due to the different gasification systems evaluated.

GASIFICATION OF TEXAS LIGNITE FOR PRODUCTION OF ELECTRICITY, SNG, HYDROGEN AND CARBON DIOXIDE VERSUS RECENT PRICES
(Dollars per Million BTU)

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	
Polygen SNG[1]							5.00-6.90
Natural Gas[2]	3.68	4.00	2.95	4.88	5.49	7.05[4]	
Polygen Hydrogen[1]							5.20-6.20
Hydrogen[3]	6.35	6.75	5.44	7.85	8.61	10.57[4]	

1 "Polygeneration of SNG, Hydrogen, Power, and Carbon Dioxide from Texas Lignite" NETL, DOE, Dec. 2004
2 EIA, DOE – Natural Gas Wellhead Prices, Annual and Monthly Averages
3 Cost of hydrogen based upon steam reforming of natural gas
4 Jan. thru Oct. 2005 Prices

This table shows that the polygeneration of SNG would have been competitive with natural gas from 2003 to the present. The polygenerated hydrogen would have been competitive with hydrogen produced by the steam reforming of natural gas from 2000 to the present. The present price for CO2 in Texas makes it profitable to recover the carbon dioxide for sale. This study demonstrates the economic feasibility of gasifying Texas lignite where the addition of carbon capture and sequestering can improve the economics.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-21. WHAT IS THIS DOCUMENT?

A: This is an excerpt from a DOE report by Mitretek, "Polygeneration of SNG, Hydrogen, Power, and Carbon Dioxide from Texas Lignite", NETL, Dec. 2004, page 8. It shows the location of the mine-mouth gasification plant and the proximity to oil fields, natural gas pipelines and refineries.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-21.

Q: THE GREAT PLAINS GASIFICATION PLANT HAS DEMONSTRATED THE COMMERCIAL SCALE GASIFICATION OF LIGNITE COALS FOR OVER 20 YEARS. ARE THERE ANY OTHER GASIFICATION TECHNOLOGIES AVAIABLE SPECIFICALLY FOR TEXAS LIGNITE? IF SO, PLEASE DISCUSS.

A: During the past 30 years since the Great Plains Gasification Plant was originally designed, there have been significant developments in gasification technology that provides improved economics and reduced emissions. The Shell Coal Gasification Process (SCGP) has demonstrated its capabilities to handle a wide range of coals, biomass and waste products. The Shell Coal Gasification IGCC Plant in The Netherlands that has been gasifying various coals and biomass since 1994. Also, a recent paper by Shell demonstrates the gasification efficiencies of various coals including Texas lignite with the SCGP. This paper demonstrates that the efficency of gasification with Texas lignite is similar to other coals. Other coal gasification processes have also demonstrated the ability to gasify Texas lignite. Furthermore, I spoke with Piet L. Zuideveld, with Shell Global Solutions, about his paper and the feasibility of gasifiying Texas lignite. Mr. Zuideveld told me that the SCGP has demonstrated its capability to gasify Texas lignite.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-22. WHAT IS THIS DOCUMENT?

A: This is an excerpt from an EPRI Presentation – "Gasification Combined Cycles 101" by Dr. Jeffrey Phillips, page 22, presented at the Workshop on Gasification Technologies, Tampa, FL, 3/2/06. This exhibit shows the Shell IGCC plant that has been operating with various coals and biomass that I mentioned earlier.

Q: DID YOU ATTEND THIS PRESENTATION?

A: Yes.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-22.

Q: I AM SHOWING YOU WHAT HAS BEEN MARKED AS PROTESTANT'S EXHIBIT P-23. WHAT IS THIS DOCUMENT?

A: This is an excerpt from a presentation by Shell Global Solutions, "Shell Coal Gasification Process Using Low Rank Coal", by Piet L. Zuideveld, presented at the Gasification Technologies Conference, San Francisco, CA, October, 2005, page 4. This exhibit demonstrates the gasification efficiency of the SCGP for various coals including Texas lignite.

Q: DID YOU PREPARE THIS EXHIBIT?

A: Yes.

Q: IS THIS A TRUE AND CORRECT COPY OF THE EXCERPT YOU MENTION?

A: Yes.

PROTESTANT OFFERS OAK GROVE EXHIBIT P-23.

VIII. CONCLUSIONS

Q: IN YOUR EXPERT OPINION, DO YOU BELIEVE THAT IT IS TECHNICALLY PRACTICABLE AND ECONOMICALLY REASONABLE TO FURTHER REDUCE OR ELIMINATE THE AMOUNTS OF NOx, MERCURY, CO2, SO2 AND PARTICULATE EMISSIONS FROM THE PROPOSED OGSES PLANT IF IGCC OR CGP TECHNOLOGY WERE USED INSTEAD OF PC COMBUSTION TECHNOLOGY?

A: Yes. The pollution control systems that are proposed for the OGSES for both mercury and NOx have not been demonstrated with lignite coal and serious problems with these systems presently exist. These proposed systems have not been proven to provide protection for the health of people or the environment. There is the substantial risk that the proposed pollution control systems will not be able to meet the proposed permit limits.

Q: IN YOUR EXPERT OPINION DO YOU BELIEVE THAT THE EMISSIONS FROM THE PROPOSED OGSES PLANT IS REASONABLE CONSIDERING THE TECHNICAL AND ECONOMIC REASONABLENESS OF OTHER AVAILABLE TECHNOLOGIES SUCH AS IGCC AND CGP TECHNOLOGIES?

A: No. The gasification of lignite coal has been commercially operating for over 20 years. The removal of mercury, NOx, SO2. particulates and CO2 have also been commercially operating for many years and has demonstrated much lower emissions than the proposed PC combustion.

Q: WHAT DO YOU BASE YOUR OPINIONS ON?

A: My opinion is based upon an evaluation of other available commercial scale technologies which compares the amount emissions, the costs for removing pollutants, my experience and my review of the proposed OGSES plant draft permit and application.

Q: IN THE COURSE OF YOUR TESTIMONY, YOU HAVE REFEERRED TO A NUMBER OF REPORTS, STUDIES, AND THE LIKE TO SUPPORT YOUR OPPINIONS AND CONCLUSIONS. IS EACH OF THESE A DATA SOURCE UPON WHICH AUTHORITIES IN THE FIELD OF ENERGY TECHNOLOGY, GASIFICATION TECHNOLOGY AND POLLUTION CONTROL EQUIPMENT WOULD REASONABLY RELY IN FORMULATING OPINIONS AND CONCLUSIONS?

A: Yes.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

A: Yes.