Testimony of Bill Fehrman
President, PacifiCorp Energy
Committee on Energy and Natural Resources
United States Senate
August 1, 2007

Thank you, Mr. Chairman for the opportunity to testify today regarding the electric utility industry perspective on the potential of integrated gasification combined cycle (IGCC) technology. My name is Bill Fehrman, and I am the president of PacifiCorp Energy, the power generation and supply division of PacifiCorp. PacifiCorp provides electric utility service in six states across the West – Utah, Oregon, Wyoming, Idaho, California and Washington. My comments today reflect my views and experiences in this industry and are not meant to represent the industry as a whole, although I believe our experiences are largely consistent with those of other companies considering investments in clean coal technologies.

Background on PacifiCorp

PacifiCorp's generation mix includes nearly every major resource available to our industry: coal, natural gas, hydroelectric, wind and geothermal power. Along with our sister company, Iowa-based MidAmerican Energy Company, we are the largest on-system utility owner of renewable electricity in the country through our corporate parent, MidAmerican Energy Holdings Company, and we are also looking to expand our nuclear capability.

Key considerations with regard to generation resources

PacifiCorp faces an enormous challenge to meet the demands of our customers. On one hand, we must bring new resources on line to serve the fast-growing demands of our Utah-based Rocky Mountain Power system. At the same time, we must meet strict new environmental requirements, particularly in the Pacific Northwest. It is critical that we move forward in a way that does not expose our customers to undue risk.

In determining our energy supply and resource acquisition strategies for next-generation technologies, we ask three key questions:

1) Is the technology commercially proven and capable of providing reliable power for our customers?
2) Is the cost and risk of the technology comparable to other available technologies?
3) Will our state regulators support these projects and allow recovery of reasonable and prudent costs of development to be included in rates?

Utilities are not encouraged to be technology developers

The answers to each of these questions must be in the affirmative in order for public utilities to invest billions of dollars in new technologies. However, at the present time with respect to IGCC technology, the answer to each of these questions is no. Utilities are largely agents of the customers we serve. We assemble and integrate the various elements of electric service – power generation or acquisition, transmission, delivery, and customer service – to provide our customers with the most reliable system possible at a reasonable price, while complying with all federal and state environmental policies that may exist.

For the most part, utilities do not individually develop technologies; we purchase technologies and operate them. The reason this is true might not be immediately obvious, but it is important to understand. No outside body tells Starbucks what it can charge for its products or what costs it can include in its prices. That is not the case for public utilities. State and federal regulators determine the rates that utilities can charge, and state statutes limit the costs that can be considered for inclusion in rates. Most state statutes only allow costs to be included in rates if the utility can demonstrate that the actions that gave rise to the costs were undertaken in a cost-effective manner, which is typically defined in terms of risk-adjusted least cost.

The role of state regulators

Our state regulators are the consumers' watchdogs and use a premise of risk-adjusted least cost to ensure that only those costs that are prudently spent are recovered in rates. This structure does not encourage utilities to become technology developers. Those responsibilities lie with the vendor community, where the market provides greater potential rewards for successful innovation. Shareholders of these companies, not ratepayers, earn the rewards of success or bear the costs of failure.

Neither utilities nor regulators have perfect foresight regarding the development of future technologies, future market conditions, or changes in environmental laws, but we make the best projections we can in our resource development decisions. We also appreciate that the American public is increasingly concerned with environmental issues generally and global climate change specifically. A significant concern as it relates to electric utilities is carbon dioxide, the byproduct of the combustion of fossil fuels. Although the primary focus has been on coal-based generation, since it produces more carbon dioxide per unit of electric energy than other fossil fuels, natural gas-fired generation also produces carbon dioxide emissions.

For a number of years, PacifiCorp's integrated resource planning process has included an estimated cost of carbon dioxide of eight dollars per ton. This is based on the assumption that at some point in the future, Congress will establish some form of greenhouse gas emissions reduction program that will increase the cost of burning fossil fuels. However, the "cost" of carbon dioxide and the timetable for mandating carbon constraints are not known. This has led to significant uncertainty as PacifiCorp has attempted to acquire or

build new resources to meet customers' growing needs. As a consequence of this uncertainty, PacifiCorp has focused on the addition of non-dispatchable renewable energy and natural gas-fired generation. Unfortunately, this does not solve our need for new baseload resources to meet growing demand for energy.

As state and federal legislative action related to mandatory greenhouse gas reduction programs move forward, we will seek to continuously update our assumptions and integrate these assumptions into our resource planning. In every case, we will seek to accomplish the same goal - providing reliable, affordable service to our customers in a manner consistent with our core "Environmental RESPECT" policy of using our resources wisely and protecting our environment for the benefit of future generations.

Today's resource choices

Today, electric utilities across the country are facing the same challenge. Reserve margins on the system decrease with each passing day, and it is unclear what the best fuel source is to meet the demands of tomorrow. Each energy resource option has positives and negatives:

Coal is domestically available, reliable and affordable, but it also creates carbon dioxide emissions at a higher rate than the other predominant fossil fuel of choice, natural gas. There are increasing efforts at grassroots levels to block construction of new pulverized coal-fired plants, even ones equipped with state of the art emissions control technology that meet all current environmental regulations.

Natural gas allows for plants that can be permitted and constructed relatively quickly and at relatively low capital costs compared to coal-fired plants. However, fuel prices are highly volatile and domestic resources and infrastructure is strained. Since 1990, the overwhelming majority of new electric generating capacity has used natural gas as its fuel, helping push gas prices higher for all uses. We also face increasing concerns that, for the first time ever, the United States will soon begin importing a substantial percentage of its gas supply from outside North America, furthering our dependence on foreign sources of supply.

Nuclear power is non-carbon emitting and has relatively low fuel costs, but we still do not have a long-term solution to the used fuel issue. Nuclear is an attractive option to consider in a carbon constrained universe, but to date no one in the United States has put all the pieces together to begin construction of a next-generation nuclear generating resource.

Renewables include a whole range of opportunities including wind, biomass, solar, geothermal, and small hydro. They provide emissions-free, sustainable energy sources. However, the primary renewable source is wind, which is both intermittent and non-dispatchable. In spite of rapid growth in recent years, thanks to Congress' extension of the Section 45 production tax credit, non-hydro renewables still only provide less than two percent of the country's generation mix. We are proud to be an industry leader in

integrating renewables into our fuel mix. However, many of the most suitable locations are already under development, and transmission costs are likely to increase substantially. Furthermore, as renewable portfolio standards mandate ever larger percentages of energy, additional sources of backup generation will need to be installed to provide the reliability necessary due to the intermittency of wind.

Hydroelectricity is also an emissions-free renewable generation source, but we are unlikely to see new large-scale hydro facilities built in the United States due to concerns about impacts on fish, river systems, and some endangered species. Indeed, the West is experiencing significant pressure to remove existing hydroelectric dams. Nonetheless, we should explore ways to maintain the hydro resources we have in an environmentally responsible way, explore cutting-edge, low impact hydro technologies, and work to gain greater efficiency from existing facilities.

Some refer to energy efficiency as a "fifth fuel," and we agree that energy efficiency represents one of the best opportunities to both meet resource needs and near-term emissions reductions. We commend the Senate, and this Committee specifically, for passing a bipartisan package of energy efficiency requirements in this year's energy bill. However, efficiency improvements only help flatten the growth of the demand curve; they do not eliminate the need for new generation resources. Energy efficiency and renewables alone will not meet the electric energy needs of this country.

What is IGCC?

As others have testified before this Committee, IGCC technology is designed to combine a chemical gasification process with traditional combustion turbine based processes to generate electricity at comparatively high rates of efficiency and low emissions levels.

While I know that members of this Committee understand the difference, I want to emphasize for the record that IGCC technology and carbon capture and sequestration are not the same thing. IGCC describes a highly integrated two-step process: (1) coal gasification to produce a gas-based fuel that can be burned in a combustion turbine; and (2) power generation. Carbon capture and sequestration is a potential complementary add-on to this technology that would convert the carbon in the synthetic gas to carbon dioxide, separate and compress it, and ultimately inject it deep beneath the Earth's surface, resulting in permanent sequestration.

Is IGCC a proven technology?

Worldwide, there are four operational IGCC electricity generating plants with generation capacity of roughly 250 megawatts each. None of these plants captures or sequesters carbon dioxide. The two plants operating in the United States (in Florida and Indiana) were built with federal funding assistance as part of the Department of Energy's Clean Coal Power Initiative demonstration projects.

IGCC is not a commercially viable technology at this time. No large scale, utility-size plant has been built, and much of the technology is unproven, which is why we have not been able to obtain price and performance guarantees from any vendors. With the technology unproven, with unclear costs, and with no guarantees from vendors, we are unwilling at this time to expose our customers to these risks. Furthermore, these plants have not consistently achieved capacity factors comparable to readily available supercritical pulverized coal plants.

Moreover, most of the information on the operation of IGCC technology is based on the use of higher ranked, higher heat content bituminous coal or pet-coke. Lower ranked subbituminous and lignite coals with lower heat content and greater moisture content can be gasified, but at lower efficiency. The industry needs significantly more experience working with these coals, especially given the quantity of these types of coals in the Western United States.

The application of IGCC at higher altitudes presents unique issues that must be addressed given that a large quantity of low rank coals are found in elevations that exceed 4,000 feet. At high elevation, the air pressure - and hence the density of air - is lower. The output of all combustion turbine-based resources, not just IGCC plants, is thus reduced at higher elevations. The output of a combustion turbine is reduced approximately 3 percent with every 1,000 feet increase in altitude. For a project operating at 5,000 feet (which would apply to much of PacifiCorp's generating fleet in the Rocky Mountain region), output losses would be 15 percent. In simple terms, this increase in elevation results in a reduction in output, although the capital cost is essentially unchanged. Relocating the facility to a lower altitude and moving the electrons by wire may seem a reasonable option, but this would move the generation away from many of the most potentially suitable carbon sequestration sites in the United States and would also require moving more coal by rail. It is important to note that supercritical pulverized coal plants do not suffer the same output losses at altitude and are therefore considered to be an excellent choice for this type of application.

For IGCC to reach its full potential in the United States, the technology must be improved, with a particular emphasis on performance with lower ranked coals and especially at higher altitudes. Funding for this improvement through the Department of Energy and research institutions should be one of our country's highest energy technology priorities. Government support for IGCC development can help direct the industry toward this higher risk technology investment and away from the default choice of natural gas. This support can take the form of accelerated depreciation; investment and production tax credits; research, development and commercial demonstration funding; performance certainty guarantees; and public-private partnerships to develop, construct and operate commercial scale IGCC plants. In this regard, PacifiCorp Energy was recently chosen as the Wyoming Infrastructure Authority's partner to pursue a high altitude, IGCC plant in the state that is designed to use Powder River Basin coal, and we are together seeking this government support.

Comparing IGCC and supercritical pulverized coal

Based on our studies, vendor and engineering-constructor information, and recent bids, as well as information we have seen from other utilities at this time, a supercritical pulverized coal plant costs roughly 25-30 percent less than an IGCC plant. Moreover, supercritical pulverized coal technology is mature and reliable, whereas IGCC is still far from having acceptable performance parameters, particularly with regard to lower ranked coals and high altitude applications. It is also important to note that today IGCC and supercritical pulverized coal emit basically the same amount of carbon dioxide.

Using traditional measures of prudence and cost-effectiveness, and given our current estimates of the "cost" of carbon dioxide emissions, supercritical coal technology is the clear risk-adjusted, least-cost choice at this time. Unfortunately, in our view, a number of states have imposed emissions reductions requirements that effectively prohibit the inclusion of electricity produced by supercritical technology. Furthermore, some states are requiring that IGCC have a carbon footprint equivalent to natural gas-fired generation. This course of action essentially would require implementation of carbon capture and sequestration. Though well-intentioned, adding this requirement to IGCC will further frustrate the development of this technology. While we do not believe this is sound energy policy, we must follow the laws of the states we serve.

If regulators and policymakers eliminate pulverized coal technology from our generation mix, choices for baseload generation are effectively limited to natural gas in the near term, with IGCC and its attendant technology risks in the intermediate term and nuclear. PacifiCorp and MidAmerican Energy will also continue to add renewable energy resources such as geothermal, wind and biomass where cost effective, but these resources supplement rather than displace the need for traditional baseload resources.

In our view, the most appropriate policy would be to encourage the deployment of supercritical coal plants, while continuing to study IGCC and other clean coal technologies. At the same time, given the large number of existing pulverized coal-fired power plants in the United States, it is critical Congress and the Department of Energy increase research and development support for pre- and post-combustion technologies that would facilitate development of commercially viable carbon capture technologies for pulverized coal generation.

This policy would allow us to meet our growth needs now, provide multiple paths toward carbon sequestration, and require both power generators and state regulators to use cost-effective clean generation technologies as soon as they are available commercially.

How does carbon capture and sequestration fit in this picture?

Carbon sequestration has been a byproduct in the oil production industry in a process known as enhanced oil recovery in which carbon dioxide is mixed with oil under the Earth to enhance oil extraction. Carbon dioxide is captured and re-injected, and ultimately the carbon dioxide is permanently sequestered below the earth's surface.

Enhanced oil recovery is a widely utilized and well established technology, although the use of carbon dioxide for enhanced oil recovery is very site specific. It is expected that the demand for additional carbon dioxide will increase as production from existing oil, using conventional means, declines and oil prices continue to remain robust. Unfortunately, the demand for carbon dioxide for enhanced oil recovery is significantly less than the amount of carbon dioxide that is expected to be permanently sequestered to meet long-term target levels.

Applying this technology to the carbon dioxide emissions streams of fossil fuel-based electric generation represents a tremendous challenge for the United States and the world. The Electric Power Research Institute's February 2007 research paper, "Electricity Technology in a Carbon-Constrained Future," demonstrates that successfully deploying carbon capture and sequestration technology provides the single largest "wedge" of carbon emissions reductions that could be achieved by the electric utility industry in meeting a goal of reducing 2030 emissions levels to 1990 levels.[1] However, broad commercial deployment of carbon capture and sequestration technology is the critical component of achieving long-term reductions in greenhouse gas emissions, both domestically and internationally.

The recent MIT study, "The Future of Coal," also endorses this course of action, stating: "We conclude that CO2 capture and sequestration (CCS) is the critical enabling technology that would reduce CO2 emissions significantly while also allowing coal to meet the world's pressing energy needs."[2]

The challenge of applying carbon capture and sequestration technology to electric power generation

Applying carbon sequestration technology to the electric power sector will present at least three major challenges compared to the more limited use of the technology in enhanced oil recovery:

1) The volume of carbon dioxide that must be extracted from all power plant emissions streams is orders of magnitude greater than those captured in enhanced oil recovery processes. A single 800-megawatt coal-fired power plant will produce approximately 6.1 million tons of carbon dioxide annually, compared to the approximately 5 million tons of carbon dioxide used annually by the largest enhanced oil recovery projects.

2) An entirely new energy infrastructure will need to be built to compress and safely transport carbon dioxide to appropriate geological formations and inject it deep beneath the Earth's surface. The United States is fortunate in that we appear to

[1] Electric Power Research Institute, "Electricity Technology in a Carbon-Constrained Future," February 2007, p. 11.

[2] "The Future of Coal: Options for a Carbon-Constrained World," MIT Interdisciplinary Study, March 2007, Executive Summary, p. x.

have the world's greatest carbon dioxide sequestration potential. However, these formations are not evenly distributed throughout the country. Fully developing a system of permanent carbon dioxide geologic sequestration sites will require the United States to build a vast interstate pipeline system somewhat similar to the natural gas pipeline system that has been created over the last 100 years. Injection wells must be drilled several thousands of feet below the Earth's surface. This will require massive investments in commodities, industrial products and manpower.

3) Carbon dioxide injection for these purposes is designed to be complete and permanent, or nearly so. The goal of sequestration is to remove carbon dioxide from the atmosphere for centuries and in a manner that is as close to 100 percent certain to avoid leakage. In addition to the physical infrastructure that must be built to facilitate carbon capture and sequestration, the federal government and the states must develop a legal and regulatory framework to support these investments. Until a regulatory permitting legal structure is developed and the issue of liability risk is addressed, it is highly unlikely that large-scale carbon sequestration can be achieved.

Research and development efforts

More research and development is needed in a number of areas. Congress must establish regulatory and legal frameworks and remove other barriers to implementation in order to allow and encourage private sector entities to move forward with investments in these technologies and commercial-scale carbon sequestration.

We recommend the following priorities:

1. Provide additional and reliable financial support to facilitate development of IGCC plants with a focus on those locations and coal types that are the most abundant.
2. Provide research and development funding for development of low-cost pre/post- combustion carbon dioxide capture processes.
3. Provide specific development goals for the advancement of IGCC technologies that focus on major components that will result in higher availability, increased performance and lower cost.
4. Provide a regulatory framework in which captured carbon dioxide is considered a commodity and not a waste/pollutant.
5. Provide financial incentives for permanent geologic carbon dioxide sequestration
6. Develop a regulatory framework for injection wells and carbon dioxide pipelines.
7. Develop regulatory and policy certainty to eliminate all liability for sequestering carbon under scientifically-based federal standards.

8. Develop a regulatory and policy position that supports the use of supercritical pulverized coal as a bridge until new technologies are proven and can be commercially deployed.

Summary

Before IGCC technology can provide a critical path toward a low-carbon future, it must be made more economically competitive, reliable, and more broadly applicable to lower rank coals and higher altitude conditions. Policy makers must understand, however, that combining a chemical process (gasification) with a mechanical process (coal-based power generation), and then capturing and sequestering the gasified carbon, is not simple and does not exist today anywhere in the world.

Policy makers must also appreciate that our first obligation as public utilities is to provide reliable electricity supplies for all our customers and that deploying new technologies to reduce carbon emissions will not come without significant increases in cost for these customers. We share the desire of Congress and the American people to proactively take actions to reduce and avoid carbon dioxide emissions as much as possible and as quickly as possible. However, technical challenges remain and emission reduction programs must be designed with these realities in mind – not based on randomly chosen timelines or politically appealing slogans.

Your committee has played a highly constructive role in holding robust examinations of these issues. We hope that all members of the Senate will take these facts into consideration in developing climate change legislation. Utilities such as PacifiCorp face growing demand for energy, and we must build some type of resource to meet this demand, as we have an obligation to serve. It is critical that as we continue to debate the future of energy supply for the United States, we don't forget our current customers, who expect to see a light come on when the switch is turned, while paying a reasonable cost to do so.

Thank you. I would be pleased to answer any questions.