

## Testimony of Dr. Gregory P. Kunkel, Ph.D.

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Before the United States House of Representatives  
Committee on Energy and Commerce  
Subcommittee on Energy and the Environment

Thank you, Chairman Markey, Ranking Member Upton and Members of the Subcommittee for the opportunity to discuss Tenaska's two commercial-scale electric generation projects using carbon capture and storage technologies – Trailblazer in Texas and Taylorville in Illinois

My name is Greg Kunkel. I am Vice President of Environmental Affairs for Tenaska, Inc.

### **Tenaska Background**

Tenaska, headquartered in Omaha with offices in Dallas, Denver and Calgary, is one of the largest independent power producers in the United States. Guided by conservative business practices - which include securing long-term contracts for our generation facilities, Tenaska has developed approximately 9,000 megawatts (MW) of natural gas-fired electric generating capacity across the United States. Tenaska affiliates also market natural gas, electric power and biofuels, with Tenaska's natural gas marketing affiliate recently ranked as one of the top ten natural gas marketers in North America. Tenaska's affiliates are also involved in private equity fund and acquisition management focused on the energy space, including renewable energy, infrastructure development, natural gas pipeline and storage, and electric transmission.

The company currently has nearly 700 employees and 2008 gross operating revenues were \$16 billion. Tenaska has grown steadily and now ranks among the top 25 largest privately-held U.S. companies based on revenues.

In recent years, Tenaska has expanded beyond its traditional power producer base.

- Tenaska Solar has invested in Soltage, [www.soltage.com](http://www.soltage.com), a Jersey City, New Jersey-based full-service renewable energy company that develops and operates solar energy stations at client sites across the U.S. These PowerStations supply a significant portion of client long-term energy needs at below retail rates.
- Tenaska's employee-owners have invested in the Nebraska Elkhorn Ridge Wind project, which consists of 27 wind turbines with just under 80 MW of electric generating capacity, enough to provide renewable energy for about 25,000 Nebraska homes.

- Tenaska Power Fund owns InfrastruX Group, a leading national provider of utility infrastructure construction and maintenance service which is well-positioned to assist in strengthening U.S. energy infrastructure. InfrastruX, [www.infrastrux.com](http://www.infrastrux.com), is headquartered in Seattle, Washington, with offices in New Mexico, New York, Pennsylvania, Wisconsin and Texas.

In recognition of Tenaska's modern electric generation fleet, the Natural Resources Defense Council ranks Tenaska as having the lowest carbon footprint of any of our peers – less than half of the national average emission rate of greenhouse gases.

As developers, rather than researchers or inventors, Tenaska is focused on environmentally-friendly power projects that use available, reliable, cost-competitive equipment and attract conservative investors requiring a reasonable assurance of success. However, I should point out, that as clean as our fleet is, like a number of our peers in the independent power and cogeneration sector, our older long-term contracts did not explicitly anticipate the need to internalize the cost of carbon control. In order to insure that these clean, efficient facilities can keep operating, we urge the Committee to provide a mechanism for holding these facilities harmless for the duration of their contracts.

With this context in mind, I now turn to carbon capture and storage (CCS) and Tenaska's Trailblazer and Taylorville projects.

### **Carbon Capture and Storage in General**

Commercial-scale CCS, utilizing geologic sequestration and enhanced oil recovery (EOR) technologies, has four important benefits:

- (1) The U.S. leads the world in proven coal reserves, and 49% of U.S. electricity is powered by coal. Continued use of coal with CCS is necessary to meet U.S. environmental, economic and national security objectives.
- (2) Use of American coal by the power sector in an environmentally-friendly way decreases overall demand for natural gas--helping both hard-pressed manufacturers facing foreign competition that use natural gas as a feedstock and consumers in both coal-dependent and non-coal-dependent areas who choose clean-burning natural gas for heating their homes and other purposes.
- (3) EOR technology boosts oil and gas production from existing U.S. fields – strengthening U.S. energy security and, on the margin, decreasing the need

to open up new fields in environmentally sensitive onshore and offshore areas.

- (4) Commercial-scale CCS is the only way to curb greenhouse gas emissions in China, India and other coal-dependent developing countries, and its widespread adoption here in the U.S. will make it possible for the U.S. to lead the world in deployment of this technology.

President Obama summed up the case for CCS last year –

*“... I am a big proponent of clean-coal technology and I want us to move rapidly in developing those sequestration technologies .... We're not going to immediately move off coal. A huge percentage of our electricity is generated by coal. What we need to do though is to put clean-coal technology on the fast track and that means money. ... We're the Saudi Arabia of coal, and the sooner we can figure out how to burn it cleanly, not only are we going to benefit but we can license that technology to countries like China and India that are putting up new coal facilities every week.”*

“Obama, Clinton Make Closing Arguments as Montana Primary Looms,”  
Flathead Beacon, May 29, 2008

### **Tenaska's Carbon Capture and Storage Projects**

I am pleased to be here to describe two electric generation projects Tenaska has in advanced development – Trailblazer in Texas and Taylorville in Illinois.

Trailblazer is a 600 MW (net) coal-fired, baseload power facility that, unlike any currently in operation anywhere, would capture 85 to 90 percent of its potential carbon dioxide (CO<sub>2</sub>) emissions and deliver that CO<sub>2</sub> for use in enhanced oil recovery operations and geologic storage. Taylorville is a 500 MW (net) hybrid Integrated Gasification Combined-Cycle (IGCC) facility that will convert coal to methane and ultimately to electricity. In the process, the project will capture 50 to 60 percent of the CO<sub>2</sub> that would otherwise be emitted.

These projects may give the Subcommittee some sense of the CCS projects that we believe can be built with today's proven technologies.

When Tenaska embarked several years ago on the process of developing these utility-scale CCS projects, high and volatile natural gas prices, combined with oversupply of natural gas generation facilities, encouraged us to consider the developing needs for baseload power facilities fueled by coal. At the same time,

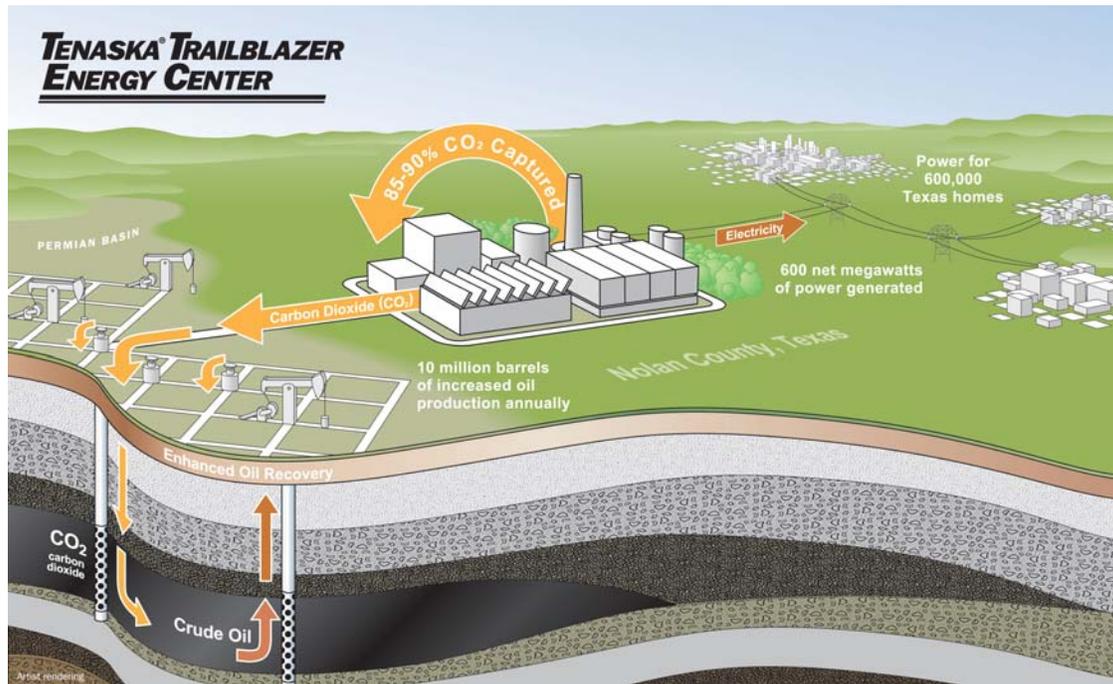
our leadership recognized that new federal, regional and state laws and regulations to control emissions of greenhouse gases from power facilities were certainly very likely during the 50-year life of these facilities. Given that new CCS projects cost as much as \$3-4 billion, we decided that we would only be comfortable if we tackled the climate issue directly.

While Tenaska has been working on its development projects, other proposed coal-fired facilities advanced to some stage of development with a handful built or under construction, but many more have encountered costly postponements and cancellations due to various combinations of escalating costs, environmental opposition, utility owner and commission concerns about long-term investment in coal, and uncertainty about future environmental and climate change-related requirements. As we all know, just last week, the Environmental Protection Agency (EPA), in the wake of *Massachusetts v. EPA* and EPA's ensuing endangerment finding, began a comprehensive rulemaking to regulate carbon emissions. Now, Congress is taking up the climate issue in earnest. The challenge becomes clearer and clearer.

Tenaska's objective has been to find ways to develop the baseload resources that the market for electricity requires. We were not willing to invest in solid fuel projects without addressing the climate change issue, so a question before us was how to reduce greenhouse gas emissions in the design of projects today. To accomplish this, we needed to assure ourselves that carbon capture technologies are ready for a utility-scale project; a secure home is available for captured CO<sub>2</sub>; and the economics and long-term financing arrangements for such projects can work. I can report progress in each of these areas.

### **Trailblazer Energy Center**

On February 19, 2008, Tenaska publicly announced the Trailblazer Energy Center, a 765 MW gross output and 600 MW net output supercritical pulverized coal electric generation facility with the capability to capture and deliver to the Enhanced Oil Recovery (EOR) markets 85 to 90 percent of CO<sub>2</sub> produced in the boiler. On the same day, we closed the site property transaction, filed an air permit application with the Texas Commission on Environmental Quality, and submitted a transmission interconnect request with the Electric Reliability Council of Texas (ERCOT). The Trailblazer idea is all about neighborhood. The site is near pipeline infrastructure that can connect the facility to the world's largest market for CO<sub>2</sub> – Permian Basin enhanced oil recovery. Two railroads serve the site, and the electrical interconnection is also nearby.



The Tenaska Trailblazer Energy Center would be the first coal-fueled power plant to capture the carbon dioxide it produces and transport it via pipeline for use in enhanced oil recovery and geologic storage.

The public comment period on Trailblazer’s draft air permit closed on April 17, and the Texas Commission on Environmental Quality will be working toward issuance of a final permit over the next few months. We have received competitive proposals from engineering and construction companies for design and construction of the facility. We are working on detailed engineering studies to support financial closing and initiation of construction in 2010. Construction requires about four and half years, so commercial operation could be as early as 2015.

Through our work with leading Engineering, Procurement and Construction (EPC) contractors and equipment manufacturers, Tenaska is increasingly confident that we can negotiate suitable terms for the construction of the plant and that we can finance the project. Local and state governments have provided tax incentives for building the plant in West Texas, and are encouraging use of the CO<sub>2</sub> from the facility by oil producers. Still needed is some form of federal incentive participation to make the project work, but that also seems increasingly likely.

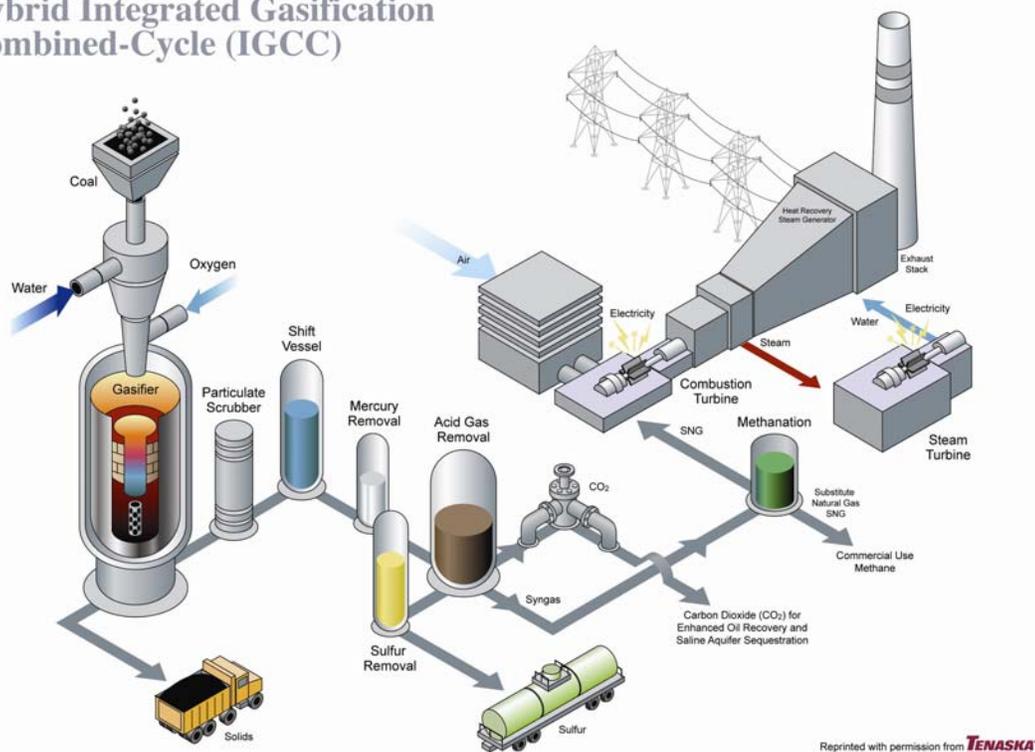
The central importance of a project like Trailblazer is that it will demonstrate, on a utility scale, post-combustion capture technology that could be applied to the 5,000 existing coal-fired power stations worldwide currently contributing 10 billion metric tons CO<sub>2</sub> annually to global emissions. In addition, projects like Trailblazer will help the U.S. maximize domestic oil and gas production from existing fields.

On a local level, Trailblazer will boost the economy with more than \$2 billion in construction spending out of a total estimated project cost of more than \$3 billion, provide 1,500 to 2,000 jobs at peak construction, and create more than 100 well-paying permanent positions to sustain operations.

## Taylorville Energy Center

The Taylorville Energy Center is a Hybrid Integrated Gasification Combined-Cycle (IGCC) electric generation facility. The developer is Christian County Generation, LLC (CCG) and Tenaska is the managing partner. The project will manufacture pipeline-quality Substitute Natural Gas (SNG), or methane, from Illinois bituminous coal. SNG will fuel a power block with two combustion turbines, two Heat Recovery Steam Generators (HRSGs), and one steam turbine. The amount of SNG produced will significantly exceed the requirements of the power block, annually freeing up 10 billion cubic feet (bcf) of SNG for transport offsite via natural gas pipeline for eventual sale to commercial and residential natural gas customers. The facility will use 2.5 million tons per year of Illinois coal, employ 1,500 construction workers, and create hundreds of permanent jobs in the coal and power sectors.

### ***TAYLORVILLE ENERGY CENTER*** Hybrid Integrated Gasification Combined-Cycle (IGCC)



The Taylorville Energy Center will use hybrid Integrated Gasification Combined-Cycle (IGCC) technology to convert coal into methane, either to sell into the natural gas pipeline or to fuel power production.

Taylorville will capture 50 to 60 percent of the carbon dioxide (CO<sub>2</sub>) that would otherwise have been emitted, remove moisture and sulfur compounds, and compress the CO<sub>2</sub> stream for pipeline transport either to nearby geologic sequestration wells in the Mt. Simon geologic formation (within Christian County, Illinois) or for use in EOR operations elsewhere (a pipeline to the Gulf Coast is proposed by others). The power island will have criteria pollutant emission levels equal to those of a combined-cycle natural gas generation facility. No electric generation facility utilizing coal or coal-derived fuel operating anywhere in the world approaches the proposed emission performance of the Taylorville Energy Center, yet the project relies exclusively on proven technologies for coal gasification, gas processing and power generation.

The Hybrid IGCC process of producing marketable SNG (methane) will result in greater operational flexibility than a more typical IGCC model, in which only synthesis gas is produced exclusively for consumption on site. In contrast, the project's SNG production will enable its power generation function and gasification processes to operate more independently, creating the means to manage fluctuations in electricity demand and commodity price volatility, and thereby improve the overall viability and success of the project. By making CO<sub>2</sub> available for EOR, the project offers important contributions to oil as well as electric and natural gas energy supplies. Demonstrating the technical and economic feasibility of coal-based power generation with carbon capture and storage technologies, the project provides a model that can be replicated in support of the domestic energy strategy of the United States.

Tenaska has a loan guarantee application pending with the U.S. Department of Energy (DOE) to finance a portion of Taylorville's \$3.5 billion total capital cost. DOE has provided \$66 million in funding for the Midwest Geological Sequestration Consortium, and Tenaska looks forward to being part of this effort.

Taylorville has a broad range of supporters, including the Illinois AFL-CIO, the American Lung Association, the Clean Air Task Force, the Illinois Citizens Utility Board, and the Illinois Coal Association.

### **Impact of Federal Policies on CCS Development Projects**

Perhaps the most important thing Congress could do to facilitate the development of Trailblazer or Taylorville is to provide **regulatory certainty**, and in particular, a regulatory framework within which a market can develop that values greenhouse gas emission reductions. In the absence of this regulatory certainty, we foresee an EPA rulemaking process with ensuing lengthy litigation that will neither address greenhouse gas emissions nor provide the certainty necessary for CCS projects, as

well as wind, solar and other innovative projects and related transmission necessary for our nation to move ahead.

The Waxman-Markey ACES discussion draft addresses many of the key uncertainties facing the CCS developer:

- Allowance allocation. Not yet detailed in the draft, allocation of emission allowances to pioneering or early adopter generation units with carbon capture and storage could potentially provide a stable source of funding if structured properly.
- Bonus allowances. The bonus allowance provisions of the draft legislation circulated last Congress by Reps. Dingell and Boucher attempted to address the commodity price risk of granted allowances by adjusting the number of allowances granted each year based upon current allowance pricing in order to maintain more predictable revenue to the project. We believe that such measures to remove commodity risk and assure steady revenues will aid in financing the project.
- Auction proceeds. Cap-and-trade proposals may produce governmental revenue by auctioning greenhouse gas emission allowances to regulated entities. Auction proceeds could assist construction of early CCS projects via performance payments for demonstrated sequestration. Along the same lines, Tenaska has supported modifications to existing Internal Revenue Code section 45Q sequestration tax credit provisions that would increase the number and value of the credits and enable reservation of a credit stream similar to a production tax credit, yet provide for an adjustment in the credit as the market for carbon emission allowances develops within a cap-and-trade regime.
- Regulatory development. The discussion draft includes a comprehensive environmental regulatory regime protective of water resources as well air quality. Sequestration itself, and the monitoring, reporting, and verification necessary to assure its validity, need definition.
- Liability management. While the issue of long-term liability at sequestration sites is under study, protection of early mover projects deserves consideration.
- Industry mobilization. Early commercial CCS projects, including Trailblazer and Taylorville, have encouraged utility equipment manufacturers, financial institutions and service providers to bring forward

competitive new offerings to address the risks and opportunities of a large new market. Federal, regional and state legislative and regulatory developments are increasing this activity, but greater certainty regarding the ultimate regulatory structure is necessary for wider commercial deployment.

In the past, Congress has employed a number of effective policies to help overcome barriers to entry and encourage new energy technologies. Tenaska supports those mechanisms that provide the greatest degree of certainty with respect to their application and that have objective guidelines. As mentioned, we are participating in the DOE loan guarantee process for Taylorville and look forward to working with DOE on other initiatives. Tax incentives provide predictability for us and our financing counterparties and should be part of the ongoing discussion.

Thank you again for your interest and for the opportunity to provide some details on Trailblazer and Taylorville. I want to express Tenaska's special appreciation to three members of Energy and Commerce for their leadership on CCS and energy generally--Congressman Terry who represents our headquarters in Nebraska, Congressman Shimkus who represents the Taylorville area, and Congressman Boucher who we owe a special thanks to for addressing our long term contracts issue in the climate change legislation he and Mr. Dingell proposed last year.

I would be pleased to respond to any questions you may have.



Greg Kunkel, Ph.D.  
Vice President of Environmental Affairs

AS THE VICE PRESIDENT OF ENVIRONMENTAL AFFAIRS FOR TENASKA, DR. GREG Kunkel is engaged in development of the company's strategic responses to climate change and other environmental issues of primary concern. Tenaska is an independent energy company that develops, constructs, owns and operates non-utility generation and cogeneration plants; provides marketing services for natural gas, electricity, and biofuels; and provides acquisition management services for private equity funds in the energy sector.

Dr. Kunkel leads environmental permitting and development for Tenaska's clean energy projects, including: the Tenaska Trailblazer Energy Center in Texas, the first proposed coal-fueled facility to capture 85 to 90 percent of the carbon dioxide (CO<sub>2</sub>) it produces for use in enhanced oil recovery; and the Taylorville Energy Center in Illinois, a hybrid integrated gasification combined-cycle plant (IGCC) that will convert coal into pipeline quality natural gas that will fuel power production or be sold, capturing at least 50 percent of its CO<sub>2</sub> emissions.

Dr. Kunkel supervises Tenaska's corporate environmental team to assure compliance with environmental requirements and directs environmental commodity transactions for Tenaska affiliates, including domestic and international carbon credits.

In 2008, Tenaska was listed in benchmarking studies by the Natural Resources Defense Council as having the best record among thermal U.S. electric generation companies for fleetwide average emissions of CO<sub>2</sub>.

Dr. Kunkel earned bachelor of arts and master of arts degrees from the University of Colorado at Boulder. He received his doctorate from the University of California at Davis.