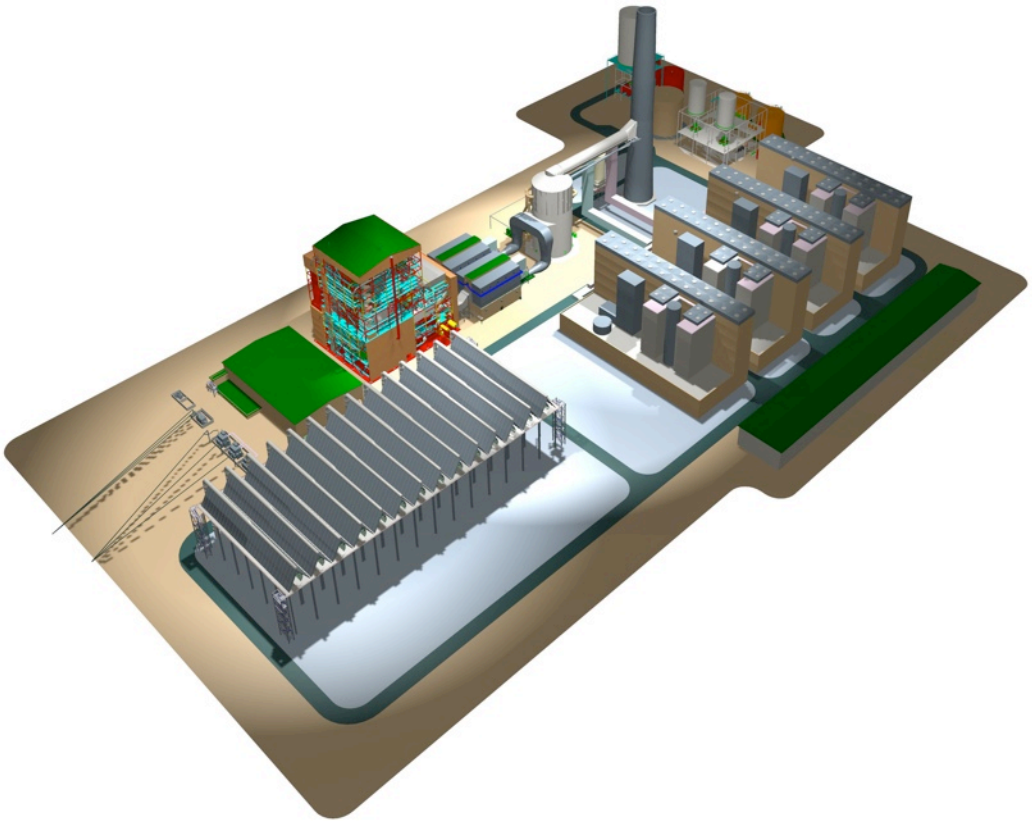
Testimony of Dr. Gregory P. Kunkel, Tenaska, Inc.



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Before the United States House of Representatives Natural Resources Subcommittee on Energy and Mineral Resources
"Spinning Straw Into Black Gold: Enhanced Oil Recover Using Carbon Dioxide"

Room 1334 Longworth House Office Building
10:00 a.m., June 12, 2008

Thank you Chairman Costa, Ranking Member, Pearce and Members of the Subcommittee.

My name is Dr. Greg Kunkel. I am Vice President of Environmental Affairs for Tenaska, Inc., and I am pleased to be here to share our views on opportunities for enhanced oil recovery using carbon dioxide captured from a power plant. I believe Tenaska can provide important insight to Congress on this matter because of an electric generation project Tenaska has in early development: a commercial-scale, coal-fired, baseload power facility that, unlike any currently in operation anywhere, would capture up to 90 percent of its potential carbon dioxide (CO_2) emissions and deliver that CO_2 for use in enhanced oil recovery operations and geologic storage.

Tenaska is a privately held company that builds, owns and operates power plants, among other business activities detailed at the end of this testimony. Congress and developers of power plants share some common interests concerning climate change legislation. You and I both want to know what it will cost to eliminate greenhouse gas emissions from power generation through carbon capture and storage technologies. If the answer to this was well known, then climate change legislation could be crafted that would pose less risk to the economy. From the perspective of the electric industry, technological risks for the first commercial carbon capture and storage facility are compounded by the fact that federal greenhouse gas cap-and-trade or other governing regulatory structures do not yet exist, and it is unclear whether state or regional regulatory structures will prevail over the long term. International obligations have not been finalized. Whereas industry looks to Congress for a structured market with rules, Congress reasonably looks to industry for at least a preliminary estimate of the costs.

Academics, policy makers and even the leadership of the G8 countries seem to agree that the country, and the world, needs a number of large-scale carbon capture and storage projects that will resolve critical technical and economic feasibility issues. Tenaska believes that enhanced oil recovery (EOR) can contribute to advancement of such a project by simultaneously providing for geologic storage of CO_2 and a significant economic benefit that could help to pay for early deployment of carbon capture technology. Whatever the costs for carbon capture and storage will be, and I do not have a final answer for you on that, I do know that net costs will be less if we can make economic use of the CO_2. The testimony that follows describes how Tenaska became interested in EOR, the development status of our project, and some thoughts on what Congress can do to advance commercial deployment of baseload generation with carbon capture and storage.

Challenge: Building Baseload Generation in an Uncertain Regulatory Environment

Tenaska is one of the nation's top developers of large, efficient power generation facilities. 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's focus is on projects that can be accomplished with available, reliable, cost-competitive equipment and for which development investments can be made with a reasonable assurance of success.

Over the last several years, market conditions for development of generation facilities have included high and volatile natural gas prices, oversupply of natural gas generation capacity in much of the country, financial failures of merchant generators, regional growth in renewable energy resources, and growing demand for "baseload" resources, like coal and nuclear, with lower and less volatile fuel costs and 24-hour-per-day operation. Many coal-fired facilities advanced to some stage of development, some have been or are being built, but many more have been postponed or canceled 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.

Tenaska's objective has been to find ways to develop the baseload resources that the market for electricity requires. We were reticent 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 were ready for a utility-scale project; a secure home was available for captured CO_2; and the economics and long-term financing arrangements for such projects would work.

New Coal Plants with Carbon Capture: Enhanced Oil Recovery as a Business Opportunity

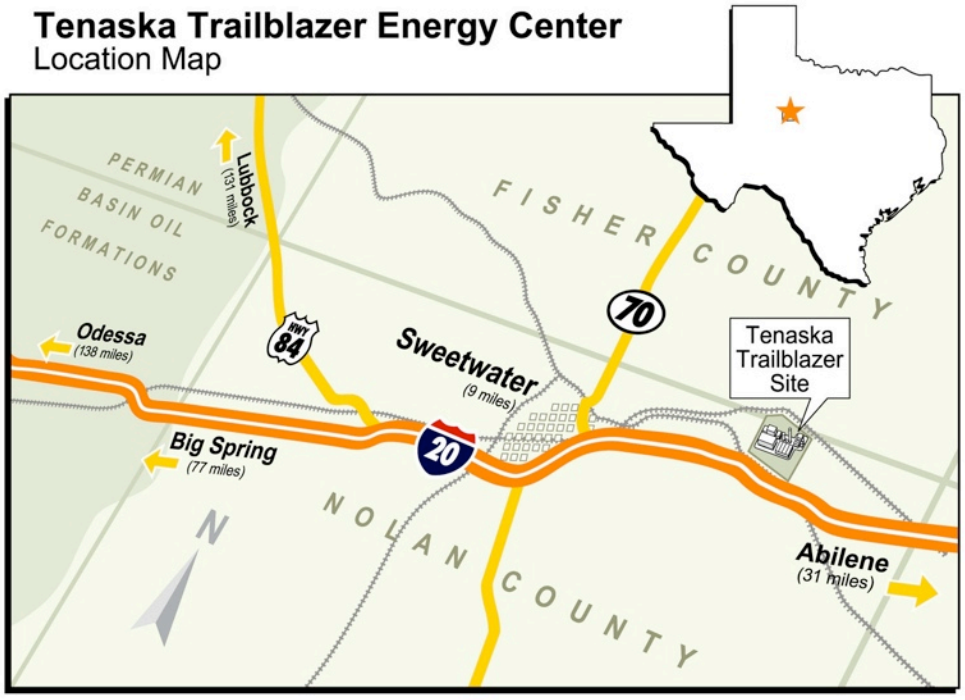
In enhanced oil recovery (EOR), Tenaska saw an attractive market for CO_2 in which geologic storage is accomplished under an existing, federal regulatory structure. Interviews with oil producers with EOR expertise suggested a considerable appetite for additional supply. However, the current opportunities to meet this demand are geographically limited, and significant barriers exist to new EOR development. Pipelines for transporting CO_2 are specialized, high-pressure pipelines with relatively high construction costs, so the distance between the source and the injection sites is critically important.

Tenaska embarked on feasibility studies to evaluate whether a coal-fired generation facility with carbon capture capability could be economically developed in or near the Permian Basin, where a robust EOR market exists. We focused on coal sourced from the Powder River Basin that would be delivered by rail. We reviewed greenfield and brownfield pulverized coal as well as integrated gasification combined cycle (IGCC) generation technologies, but ultimately selected supercritical pulverized coal with amine CO_2 capture technology for further work.

Some of the well-known advantages of IGCC technology with respect to CO_2 capture efficiency are to some degree offset by reduced efficiency of combustion turbines at the altitude of West Texas sites. Supercritical pulverized coal technology enjoyed a relative advantage in our analysis with respect to equipment availability, cost certainty, reliability, industry experience, competitive procurement and development costs. Amine-based CO_2 absorber/stripper systems have been in operation on smaller scales and represent the more mature technology available for utility carbon capture applications. Tenaska continues to evaluate alternative technologies, including ammonia-based systems.

In October, 2007, Tenaska committed funding for engineering, site development, and permitting of a supercritical pulverized coal facility with carbon capture to serve the Electric Reliability

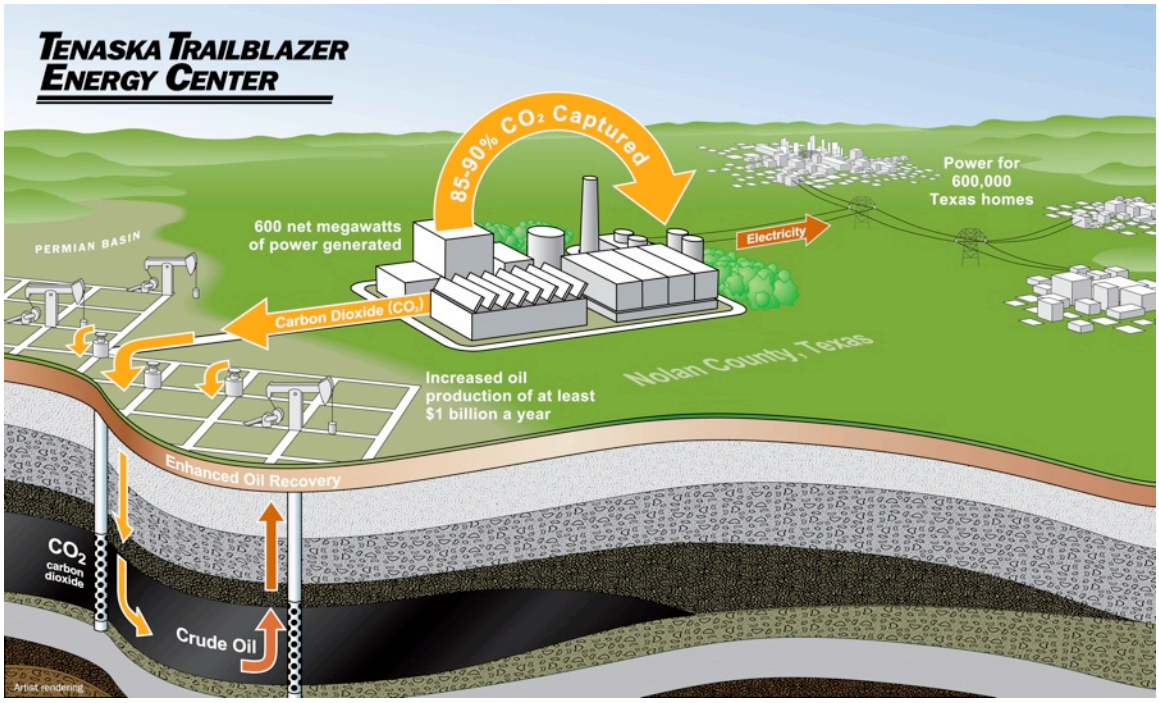
Council of Texas (ERCOT) and Permian Basin EOR markets. The ERCOT power market provides good opportunities for a facility of the sort we are proposing. It has a need for baseload power and the ERCOT transmission system is located in suitable proximity to the Permian Basin, where good EOR opportunities exist. In addition, it is a market with which Tenaska is very familiar. We have developed approximately 3,500 MW of generation capacity in ERCOT, and our power marketing group is headquartered there.



The Tenaska Trailblazer Energy Center would be located near Sweetwater, Texas, close to the Permian Basin border.

Tenaska's 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 EOR markets 90 percent of CO_2 produced in the boiler. On the same day, we closed the site property transaction, an air permit application was filed with the Texas Commission on Environmental Quality, and a transmission interconnect request was filed with ERCOT.



The Tenaska Trailblazer Energy Center would be the first electric generating station to capture the carbon dioxide it produces and transport it via pipeline for use in enhanced oil recover and geologic storage.

Tenaska is fully focused on the development of Trailblazer. Our schedule calls for completion of studies to support engineering, procurement and construction contracting as well as issuance of key environmental permits by the first quarter of 2009. Financial closing and initiation of construction may be as early as the fourth quarter of 2009. Construction requires about four and half years, so commercial operation could be as early as 2014. Currently, we are performing technical and economic analyses of competing carbon capture technologies and vendor offerings; transmission studies are underway; water resource studies are in process; and intensive permitting and site development work is ongoing.

Merits of Trailblazer include the following:

- 600 MW of needed baseload generation capacity to the ERCOT electric transmission grid.
    - Addition of baseload power reduces marginal power prices to the benefit of consumers across the system.
    - Coal-fired capacity helps insulate Texas electric customers against natural gas price volatility.
- Enhanced Oil Recovery and Carbon Sequestration
    - Availability of CO_2 renders a greater fraction of the original oil in place recoverable, thereby adding to recoverable reserves.
    - Actual production of oil is increased. If the historical Permian Basin EOR response is used as a guide, this could mean more than 34,000 incremental barrels of oil per day associated with Trailblazer's 300 million cubic feet per day of CO_2.
    - Recapture and re-injection of CO_2 produced with the oil can provide a high percentage of permanent geologic storage of the gas.

- Economic Impact
    - Provide 1,500 to 2,000 jobs over a lengthy construction period.
    - Create more than 100 permanent and well-paying jobs.
    - Stimulate the local economy with construction spending over $2 billion and a total project cost over $3 billion
    - Enable $1 billion incremental Permian Basin oil production annually.
    - Reduce the rate of decline of U.S. production and dependence on imported oil.
- Environment
    - Post-combustion capture, if successfully demonstrated on this scale, could have a wider application. Indeed, our investigation indicates that retrofitting existing coal stations with CO_2 capture technology may have about the same cost as the addition of this equipment to a new facility. According to the Intergovernmental Panel on Climate Change (IPCC), there are about 5,000 large power plants worldwide with combined emissions of over 10 billion tons of CO_2 per year.
    - Higher levels of sulfur dioxide (SO_2) removal will likely be needed, pushing criteria pollutant emissions control to a new level.
    - An opportunity is presented for recapture of flue gas water that may enable gains in water use efficiency.
    - Trailblazer may also utilize air cooling or hybrid cooling systems that further decrease water requirements.
    - Expanded production of oil from existing fields has less impact than development of new fields.

Commercial Challenges Facing Trailblazer

For Trailblazer to become a commercial enterprise, there are significant challenges to overcome. Many of the more substantive challenges relate directly to the carbon capture and storage component. The costs of carbon capture using existing technology scaled to utility-sized application are daunting. The capital investment in carbon capture could add as much as a $1 billion to a $2 billion power plant, when financing and other "soft" or indirect costs are included. There are ongoing operating costs as well. At Trailblazer, the equivalent of 200 MWs of electricity and steam may be consumed in the CO_2 capture and compression process that otherwise would be delivered to the ERCOT power grid.

There are other, less direct "early-adopter" costs associated with introducing new technology that will affect Trailblazer. New technologies carry inherent risk. Until the first commercial plant is built and operated, and the risks have been quantified, each participant in the development, construction, and financing process will place a risk premium on their participation to cover unknown but real contingencies. Once there is a suitable track record for commercial utility-scale carbon capture technology, associated risks can be assumed by those most capable of mitigating them and the risk premium will be reduced.

Since announcing Trailblazer in February, my colleagues and I have been busy explaining the project to local and regional stakeholders and policymakers and also to staff and members of Congress here in Washington. The response has been generally very supportive, even among groups and individuals long opposed to new additions of coal-fired generation capacity. To maintain that support, we recognize that continued engagement will be needed throughout the development process, and we have much yet to do.

Impact of Federal Polices on Trailblazer

Perhaps the most important thing Congress could do to facilitate the development of Trailblazer or similar carbon capture and storage projects, is to provide **regulatory certainty**, and in particular, a regulatory framework within which a market can develop that values greenhouse gas emission reductions. Without regulatory certainty and recognition of the value of emission reductions, developers are confronted with making multibillion dollar decisions in a policy vacuum. No developer can operate effectively while having to speculate on regulatory outcomes, especially outcomes so fundamental to the success of the enterprise.

Accordingly, we have developed Trailblazer in anticipation of federal climate change legislation that would support, through placing a price on greenhouse gas emissions and other means, the significant capital and operating costs of carbon capture technology. Without climate legislation, it appears that revenues from enhanced oil recovery CO_2 sales will be insufficient to cover all carbon capture costs. With proposed climate legislation, projected compliance cost savings and other effects of climate change legislation, combined with EOR revenues, would provide the needed economic incentives to build and operate Trailblazer.

Some of the potential areas where climate change legislation could affect the project are:

- Allowance allocation. Most cap-and-trade legislative proposals include some free allocation of emission allowances for new sources, and may include bonus allowances for generation units with carbon capture and storage.
- Auction proceeds. Cap-and-trade proposals may produce governmental revenue by auctioning greenhouse gas emission allowances to regulated entities. Auction proceeds may be directed to construction of early carbon capture and storage projects or performance payments for demonstrated sequestration.
- Industry mobilization. Utility equipment manufacturers, financial institutions and service providers would be encouraged to bring forward competitive new offerings to address the risks and opportunities of a large new market. To some degree, this is occurring in advance of legislation, but is clearly a result of the industry's sense that climate change legislation is inevitable within the next couple of years. An interesting byproduct of our investigation of capture technologies is that there does not appear to be an insurmountable cost penalty for retrofit applications. This implies a potential to apply similar technology to much of the nation's existing fossil fleet.
- Regulatory framework. Climate change legislation will likely provide for further regulatory development to provide for the establishment of greenhouse gas registries, industrial emission monitoring rules, permitting, monitoring and verification of greenhouse gas sequestration sites; and address long term liability for geologic storage sites. Sequestration achieved through EOR needs to be specifically recognized in such regulations. Development of the regulatory framework is critically important.
- Increased electricity price. Almost any kind of climate change legislation will associate a cost with emissions of greenhouse gases such as CO_2. Because of compliance costs of uncontrolled generation facilities, higher market electricity prices can be expected.

In the past, Congress has employed a number of effective policies to help overcome barriers to entry and encourage new energy technologies. We support those mechanisms that provide the greatest degree of certainty with respect to their application and that have clearly established guidelines. We prefer investment tax credits more than federal grants or loan guarantees primarily because the predictability of receiving tax policy benefits is greater and more controllable than the possibility of being awarded a grant or loan guarantee by a federal agency. Such accounting practices as an accelerated depreciation standard applied to the carbon capture component of Trailblazer would facilitate faster recovery of investment capital, and would provide a material incentive that we and our financing counterparties could evaluate with a higher degree of certainty. Absolving early sequestration projects from CO_2 liability would similarly facilitate more enthusiastic participation by the financial community.

Should the House decide to pursue a cap-and-trade mechanism similar to what has been contemplated in the Senate, we would advocate for an economy-wide approach. We would support bonus provisions for early adopters, and for EOR to be eligible for the same level of benefits as other CO_2 sequestration mechanisms. We would prefer that natural gas be regulated upstream from the emission source, to encompass a greater number of emitters while regulating fewer sources, and to avoid cost-recovery issues for entities holding long-term power delivery contracts.

Conclusion

Tenaska confronts many significant challenges in its effort to take the Trailblazer project from concept to reality. Trailblazer has been designed in anticipation of federal climate change legislation. In the absence of such legislation, Trailblazer faces costs and risks that likely cannot be offset by revenues from power generation and marketing CO_2 for enhanced oil recovery. Trailblazer can wait until federal legislation is enacted or Congress can act in other ways to support such a project now.

Thank you again for your interest and for the opportunity to provide some details on this exciting project. I would be pleased to respond to any questions you may have.

About Tenaska

Tenaska is an energy company that develops, constructs and operates non-utility electric generation and cogeneration facilities that it owns in partnership with other companies. The company also markets natural gas, electric power and biofuels and provides energy risk management services. In addition, Tenaska is involved in asset acquisition and management, fuel supply, natural gas transportation systems and electric transmission development. Tenaska was founded in 1987, and is a privately held company with headquarters in Omaha, Nebraska, and regional offices in Texas, Colorado, and Alberta, Canada. The company currently has more than 600 employees; 2007 gross operating revenues were $11.6 billion.

Tenaska has considerable experience as a developer of electric power generation, having built more than 9,000 megawatts of highly efficient, state-of-the-art power generation facilities associated with more than $10 billion in total financial transactions.