

2008
REPORT ON SOLUTIONS
TO TEXAS POWER NEEDS

finding
SOLUTIONS

NEW LEGISLATION OFFERS

INCENTIVES FOR CLEAN ENERGY

ANSWERS TO STATE'S GROWING

DEMAND FOR ELECTRICITY



FROM DEMONSTRATION TO DEPLOYMENT: TEXAS STRIVING TO MAKE NEW TECHNOLOGIES A REALITY



CLEAN COAL
TECHNOLOGY
FOUNDATION
of
TEXAS



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LETTER FROM THE CHAIRMAN



Fellow Texans:

The Clean Coal Technology Foundation of Texas is pleased to introduce our 2008 publication, Finding Solutions. Since our inception in 2004, the Foundation has been working tirelessly to provide a roadmap for Texas' growing energy demands, and Finding Solutions represents a significant step forward toward making technology solutions a reality.

The principles of the Foundation are to ensure Texas can meet our growing energy demands, enable continued economic growth, and to ensure environmental responsibility while meeting those needs. We have that responsibility for our children and grandchildren.

Texas' growth depends upon supplies of electricity that are reliable and cost advantaged. Coal is a big part of how we have built our current economy and continue to enjoy the reliable, cost effective energy supply in our state. Solutions for our current installed capacity must be addressed and promoted.

Equally important is the need for future additional electricity and the critical challenge to develop technical options and improvements, as well as the use of alternative energy technologies. Coal, too, must be an integral part of our future, as it is our most abundant indigenous resource, provides energy security and in-state jobs and commerce, and will continue to provide cost advantage.

It is our responsibility to not simply talk about today's regulations and today's requirements – but to embrace the challenges of the future that are upon us today in terms of CO2 and greenhouse gases. We must advance technology through demonstrations and investments aimed directly at these challenges. These demonstrations must be progressive, meaningful in terms of scale and aimed at rapid commercialization for full scale plants for today and tomorrow. Coal is deeply ingrained in America and Texas' history and future, and we must accept these challenges head on.

It has been my honor to have been chosen by our members to lead our Foundation into the next key phase of Texas' energy story. It is my privilege to reach out to all of those in the public, private, governmental, and industrial sectors and encourage this progress. Please join us. We must foster collaboration, develop these technical solutions and demonstrations sites, and proactively create our future.

There is much at stake. It is our time to act.

Sincerely,

C. D. McConnell
Chairman
Clean Coal Technology Foundation of Texas

“These demonstrations must be progressive, meaningful in terms of scale and aimed at rapid commercialization for full scale plants for today and tomorrow.”



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Texas Governor Rick Perry signs House Bill 3732 as the bill's author, state Representative Rick Hardcastle (standing to Governor Perry's right with hand on table), and members of the Clean Coal Technology Foundation of Texas look on.

HARDCASTLE LEGISLATION MEANS CLEANER TEXAS

Texas House Energy Resources Committee Chair Rick Hardcastle of Vernon is convinced that HB 3732 gives Texas the highest clean-energy standards in the nation and will help local communities build clean power facilities.

"House Bill 3732 means cleaner air, cleaner energy and a cleaner Texas. Through financial, tax and regulatory incentives, this legislation encourages the development of advanced clean energy projects that will use the next generation of technology to produce cleaner, more affordable and more reliable electricity," said Hardcastle, the author of HB 3732.

Governor Rick Perry signed HB 3732 shortly after the session ended.

Hardcastle noted that HB 3732 has already attracted statewide praise as the only significant air quality bill to pass the Texas Legislature in 2007.



Texas House Energy Resources Committee Chairman Rick Hardcastle of Vernon.

To qualify as an advanced clean energy project, and be eligible for the incentives under this bill, an energy plant must meet all of the 2020 federal emissions standards for sulfur dioxide, mercury, nitrogen dioxide, and be carbon-capture ready.

Hardcastle said HB 3732 is also an important economic development tool for rural areas because it will promote the building of FutureGen-like clean power plants.

"Regional Councils of Government and cities throughout Texas, including the city of Vernon, have identified local resources that are available to build clean energy projects. This legislation puts in place real incentives and offers concrete support that is available to help get these local projects built," Hardcastle said.



Stephen Raines, (left) policy analyst for Texas House Speaker Tom Craddick, and Zak Covar, (right) natural resources adviser to Texas Governor Rick Perry, receive awards for their work on advanced clean energy legislation from Clean Coal Technology Foundation of Texas 2007 Chairman Gary Gibbs (second from left) and Randy Eminger, a founding member of the Foundation.

TEXAS BECAME A NATIONAL ENVIRONMENTAL LEADER IN PROVIDING INCENTIVES FOR CLEAN COAL TECHNOLOGIES THAT COULD CURB GREENHOUSE GASES WITH THE PASSAGE OF STATE HOUSE BILL 3732 EARLIER THIS YEAR.

Employing a combination of tax, financial and regulatory incentives, the legislation paves the way for the development in Texas of the next generation of advanced clean energy projects. Projects whose technology could have national and global commercial-use applications as energy producers and regulators strive to balance an ever-increasing demand for electricity with environmental protections.

"House Bill 3732 means clean air, cleaner energy and a cleaner Texas," said Vernon state Rep. Rick Hardcastle, who authored the legislation as chairman of the Texas House Energy Resources Committee.

HB 3732 appears to be the most significant legislation to pass in this country with the express intent of improving power plant emissions.

"HB 3732 is designed to bring to Texas a new generation of advanced clean energy technologies that use coal, biomass, petroleum coke, waste materials and fuel

cells using hydrogen derived from such fuels to meet our state's growing energy needs," said Gary Gibbs, 2007 chairman of the Clean Coal Technology Foundation of Texas (CCTFT), which helped craft the legislation and worked with lawmakers to successfully guide the measure into law.

"Energy companies throughout the nation and around the world should now view Texas as a much more attractive place to invest in clean energy projects. This forward-thinking legislation also spurs companies in Texas to make existing plants cleaner," Gibbs said.

HB 3732 should be considered landmark legislation for several reasons:

- It puts Texas at the forefront of protecting human health by creating the most stringent emissions standards in the United States for power plants seeking to be designated as an advanced clean energy project.
- It recognizes that carbon capture and sequestration technology adds significantly to the cost of building clean energy power plants.
- Through the tax, financial and regulatory incentives, the state of Texas is a full partner in making these clean energy plants a reality.

CLEAN ENERGY QUALIFICATIONS

To qualify as an advanced clean energy project, and to be eligible for the incentives, an energy plant must meet all four of the following emissions standards.

Although these are clean coal emissions goals the federal government has set as targets for

in the
search for solutions
to air emissions, Texas offers

HB 3732



“HOUSE BILL 3732 PUTS IN PLACE
REAL INCENTIVES AND OFFERS
CONCRETE SUPPORT THAT
IS AVAILABLE TO HELP GET
LOCAL PROJECTS BUILT”



the year 2020, Texas projects will have to meet them 12 years earlier. The emissions profiles were taken directly from the 2005 Energy Policy Act “2020 Clean Coal Power Initiative Goals” passed by Congress and implemented by the U.S. Department of Energy (DOE).

The requirements are:

- Reduce sulfur dioxide (SOx) emissions by 99 percent
- Reduce mercury emissions by 95 percent
- Meet a nitrogen dioxide (NOx) emissions rate of no more than 0.05 pounds per million BTUs
- Render carbon dioxide capable of capture, sequestration or abatement.

Additionally, the plants must use coal, biomass, petroleum coke, solid waste or fuel cells using hydrogen derived from these fuels. The incentives also apply to liquid fuel projects such as coal-to-liquid (CTL) projects so long as they co-generate their own electricity.

“The fact that liquid fuel and hydrogen fuel cell projects are eligible for state incentives will put Texas in a unique position to attract cutting-edge programs that will be a critical piece of U.S. energy independence in the years to come,” Gibbs said.

It is anticipated that the property tax abatements and exemptions, and the time-certain permitting are likely to provide the greatest incentives to attracting advanced clean energy projects to Texas

and spurring the retrofitting of existing plants so they will meet the tougher air emission standards.

When the investment of \$1 billion or more is on the line for a single new power plant, investors and shareholders will place a high value on the fact that a project’s fate will be decided in a specific amount of time.

The current ambiguous timeframes for reaching a final decision on the state permits required to operate a power plant in Texas often are used as a weapon by opponents of the plants, and this uncertainty constitutes a major deterrent to the construction of new power sources.

TIME-CERTAIN PERMITTING
(Section 382.0566-.0567, Health and Safety Code)

HB 3732 strikes a fair, workable compromise on the permitting issue by:

- Requiring the Texas Commission on Environmental Quality (TCEQ) to make a final decision on an air permit application for an advanced clean energy project within 18 months after initially determining the application is administratively complete.
- Capping the technical review process at nine months and the public hearing process at nine months. A three-month extension is allowed if TCEQ determines that the number of pending complex applications will prevent it from meeting the nine-month hearing deadline.
- Preserving the public’s right to notice and a contested case hearing.

Equally important are the tax abatements and tax exemptions contained in HB 3732. While the bill contains modest state funding for loans and grants, the tax provisions are designed to spur companies in Texas to retrofit

“TEXAS POLICYMAKERS
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HB 3732 ENCOURAGES INNOVATION

By Mike Nasi

Beyond the financial incentives and time-certain permitting provisions in HB 3732, the legislation clarifies existing law in two significant areas to ensure that projects looking to push the technology envelope are not deterred from doing so by often-misinterpreted provisions of the Texas Clean Air Act.

- First, the bill clarifies that new technologies will not be discouraged through the “Best Available Control Technology” (BACT) or “Lowest Achievable Emission Rate” (LAER) requirements. The bill sets the record straight that the Texas Clean Air Act does not require a project to prove that the technology being proposed has been previously demonstrated on a commercial scale.

This is an argument opponents of new power projects have attempted to use to defeat permits, despite the obvious contradiction of such a position with the goal of encouraging projects to deploy state-of-the-art technology, even if they are the first to attempt it on a full-scale, commercial level.

- Second, the bill clarifies that emission reductions achieved by advanced clean energy projects qualifying for incentives under the bill do not necessarily set a new bar for what is “achievable” in a BACT or LAER review, unless there is an independent basis for coming to that conclusion. This provision is modeled after similar language passed by Congress in the Energy Policy Act of 2005.

The purpose of this type of provision is to encourage companies to innovate without the threat that their existing fleet of facilities will be immediately shut down simply because a new, subsidized facility has successfully achieved lower emission levels than the existing, unsubsidized fleet.

Mike Nasi serves as counsel for the Clean Coal Technology Foundation of Texas.



Texas Railroad Commission Chairman Michael L. Williams (left) shares a laugh with Tom Wilkinson, executive director of the Brazos Valley Council of Governments, at the ABEC/CCTFT conference in March.

existing plants or to build additional advanced clean energy projects.

The local property tax abatements will be important to the development of FutureGen-like projects in locales throughout Texas, where there is heightened regional interest and support for new power generating facilities.

"When the state of Texas issued a Request for Proposals to Regional Councils of Government interested in hosting the FutureGen project, 15 communities put forth proposals. Almost every one of these Councils of Government has shown a willingness to develop their own version of FutureGen-like, clean-power facilities," Chairman Hardcastle said.

"These communities and regional groups have identified local resources that are available to build clean energy projects.

These power plants represent jobs and opportunities for all of Texas. Local leaders asked the Legislature for our help, and we responded with House Bill 3732, which puts in place real incentives and offers concrete support that is available to help get these local projects built," he said.

PROPERTY TAX EXEMPTIONS (Sections 11.31 and 26.045, Tax Code)

- The bill instructs the TCEQ to develop and maintain a pre-determined list of pollution-control equipment to include, but not be limited to, a series of technologies delineated in the Tax Code.
- The bill further requires the TCEQ to update the list no less than every three years and not to remove items from the list without compelling reasons for doing so.
- The bill adds a subsection to create a more predictable and streamlined process for securing favorable local tax treatment for equipment on the pre-determined list of pollution-control equipment by confirming that the equipment will automatically qualify for such tax treatment.

PROPERTY TAX ABATEMENT ELIGIBILITY (Section 313.024, Tax Code)

- Adds the newly defined term "advanced clean energy project" to the types of projects eligible for local property tax abatements (but does not mandate those abatements). Additional local property tax abatement benefits under Chapter 313 of the Tax Code are provided for Integrated Gasification Combined Cycle (IGCC) projects as a result of the enactment of House Bill 2994.
- Most of the key incentives take effect on January 1, 2008 and expire on September 1, 2020.
- The bill provides for a periodic review of the emissions profile by TCEQ and the State Energy Conservation Office (SECO) in 2012 and 2016 and for SECO to issue



Hoxie Smith (left) and Steve Melzer with the Permian Basin FutureGen Task Force learn how HB 3732 can promote advanced clean energy projects in West Texas.

a report in 2015 regarding the need to continue the program.

GRANT AND LOAN PROGRAM (Section 447.014, Government Code)

- Creates an "Advanced Clean Energy Grant and Loan Program" to be administered by SECO.
- Funds the program through the Advanced Clean Energy Account, which is established by the bill and funded up to:
- \$20 million for grants from redirected gross receipts tax from existing power generating sites;
- \$10 million for loans from redirected gross receipts tax from existing power generation sites; and
- If additional legislation is passed and if voters statewide approve a subsequent constitutional amendment, \$250 million from the sale of general obligation bonds issued by the Texas Public Finance Authority will be available.

GROSS RECEIPTS TAX EXEMPTION

(Section 182.022(c), Tax Code)

- Exempts sales of electricity generated by an advanced clean energy project from gross receipts tax.

This has the potential to effectively discount the price of advanced clean energy power by nearly 2 percent. Electric utilities pay four tiers of state taxes (property, sales, margins, and gross receipts) and this creates an exemption for only the gross receipts tax, whose rate is currently 1.9 percent.

House Bill 3732 becomes effective Jan. 1, 2008. On that date, the state of Texas, business organizations and policymakers will show once again that they are doing more than just talking about greenhouse gases, emissions limits and cleaner ways to produce electricity. They are putting programs in place that the nation can look to as the model for clean power.

HB 3732 Creates Added Value for CO₂

The carbon capture approach that FutureGen and FutureGen-like power plants would use to remove carbon dioxide from emissions typically envisions sequestering the gas in underground geologic formations.

In Texas, and other oil-producing states, CO₂ has an additional use: Enhanced Oil Recovery (EOR), where CO₂ is injected into an oil field following primary and secondary recovery. The gas pushes remaining oil to a production wellbore so it can be recovered.

First tried in 1972 in Scurry County in west Texas, gas injection accounts for nearly 50 percent of EOR production in the United States, according to the U.S. Department of Energy.

Texas Railroad Commission Chairman Michael Williams, whose agency regulates oil and gas producers and permits EOR operations, notes that HB 3732 creates additional value for captured CO₂ by incentivizing oil and gas producers to seek out man-made CO₂ for EOR use.

"Producers currently receive a 25 percent reduction in severance taxes for using CO₂ for EOR. HB 3732 increases the severance tax reduction another 50 percent, for an overall reduction of 75 percent, creating a significant demand for man-made CO₂," Williams said.

Tax Exemption for Oil Recovered from EOR Projects (Section 202.0545, Tax Code)

- 75 percent severance tax exemption for oil recovered from Enhanced Oil Recovery (EOR) projects that use anthropogenic (or man-made) carbon dioxide.
- Ensures seven-year term for exemption, or longer if carbon is not yet regulated as a pollutant.
- Requires carbon to be captured from an industrial source in Texas and sequestered in Texas.



Michael Williams

interview:
WILLIAMS ON
ENERGY, FUTUREGEN

by Christine DeLoma / The Lone Star Report
September 27, 2007

Michael Williams, recently elevated to chairman of the Texas Railroad Commission, wants more clean, affordable energy, and he wants it as fast as possible: not least to keep up with population growth linked to state prosperity. Williams, a Republican who joined the commission in 1999, is chairman of the Texas FutureGen advisory board and the Governor's Clean Coal Technology Council. He sat down recently with LSR to give his take on the future of energy production in Texas.

LSR: What challenges do you see for Texas' demand and supply for energy over the next 20 years?

WILLIAMS: I think the most significant challenge facing Texas as it relates to... energy relates to the fact that Texas is going to enjoy significant population growth over the next 20 years and coming with population growth obviously means there's going to be an increase in the demand for energy both on the transportation side as well for electricity.

On the transportation side, we already know that we in the country consume 60 percent of the crude [oil and what] we consume comes from foreign sources. And so there's an increased need for us to increase Texas and American production.

But in addition to that, there's a necessity for us over the next 20-some odd years to develop complementary transportation liquids and transportation fuels, whether that is carbon liquid, cellulose, ethanol, biodiesel, [or] biomass.

On the electricity side, again with that increase of population comes obviously increased demand for power.

And we have to recognize that affordable energy relates [to] and drives economic growth and prosperity, and particularly on the electricity side that means that we've got to invest more in clean coal as well as nuclear power, at the same time maintaining our significant production in natural gas and then complementing that with, obviously, renewables and energy efficiencies and conservation.

LSR: You mentioned our need to invest in clean coal technology. What is FutureGen, and why should Texans care?

WILLIAMS: FutureGen is a science, research, and development project that is going to allow Texas and America to use one of the fuels that we have in great abundance, and that is coal - so that we can make affordable electricity [and] also have that electricity be clean.

And Texans should care about it, because in order for Texans to enjoy a strong economy... we have [to have], at least we've had in the past, affordable electricity.

But as we've grown there's going to be strains, there's already strains on utilizations of natural gas.

We've got to be able to use coal, but that coal has to be not only cheap, it has to be clean.

FutureGen is going to provide us with the knowledge about how we use this source that we have in great abundance — a 250-year supply in America, a 200-year supply here in Texas — how we're going to use that abundant supply to make cheap and clean electricity and how we can deal with the issue of CO2 and to manage CO2 through carbon capture and storage.

LSR: What is the status of the FutureGen project?

WILLIAMS: We submitted our best and final offer August 1. The FutureGen Industrial Alliance sent us some clarifying questions. They were here in Austin last week, and we answered all of their questions.

We are told they would make their decision late November [or] early December as to which one of the four sites in the two states would be the winner... We have two sites, and Illinois has two sites. One of our sites, as you know, is outside of Odessa, and the other is in Leon County in the city of Jewett.

LSR: What do you think about the TXU coal plant controversy? Do we need more traditional coal plants in Texas?

WILLIAMS: I think the TXU controversy highlights the challenge that we have in providing reliable and sufficient amounts of electricity to Texas and the question that we have about providing clean electricity. It also highlighted the need for us to be aggressive in the research and development into the innovative technologies.

Arguably FutureGen is one, but there are others.

So what the TXU controversy did was bring that into direct focus that we have a challenge in order to bring affordable electricity as well as clean electricity [to Texas].

And, quite frankly, what I think we need to do — and this is going to be a step-by-step process — we're going to have to build more traditional coal plants in the near future, but they are cleaner than the plants that are out there now.

And we need to hurry and move to clean coal technology as well as wind and solar and renewables, energy efficiency and conservation.

And at the same time we need to be making sure that the questions that we ask about nuclear we can answer so that we can bring nuclear power on as well.

LSR: I've read that you've bought a hybrid vehicle and before that you had a flex-fuel vehicle. How is that working out for you?

WILLIAMS: I drive a Lexus SUV hybrid... I think my Ford Explorer was getting somewhere around 16 and 17 miles per gallon [on the highway]. I get on the highway now in my Lexus somewhere now between 25 and 26 miles per gallon, and in the city I get anywhere between 22 and 23. In addition to that, obviously I have less emissions of particulate nitrous oxide than I did with my Ford Explorer.

So I am thoroughly enjoying it and would encourage others to do what they can.

LSR: Is there anything you'd like to add?

WILLIAMS: I thoroughly enjoy my work at the commission. There are a lot of big things that we have to do going forward. But the bottom line, I think, each of us as commissioners, each and every day we get up we recognize it is our job to make sure Texans have affordable, clean, reliable and safe energy. That's an interesting challenge, particularly in this time and particularly with the expected growth, tremendous growth in the state.

Affordable energy, plentiful energy, clean energy is of paramount importance particularly as Texas is poised to grow in a significant way over the next two decades.

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U.S. energy consumption is increasing 2 percent annually, meaning that the demand for electricity is projected to increase 50 percent in the next 25 years.

Coal supplies 50 percent of U.S. electricity and will continue to do so for the foreseeable future. Like all energy sources, pros and cons surround the use of coal to produce electricity.

In the following pages, Praxair, Evergreen Energy and AEP offer possible solutions to improving coal's performance. We plan to highlight other processes in the future.

McConnell said these projects provide an excellent opportunity to demonstrate world-class scaleable technology that can be replicated elsewhere. The New York demonstration project is being closely watched both by the energy industry and the public to see if what has been done on a such a size can then be scaled up and made to work on a larger, commercial scale.

TEXAS PARTNERS, LOCATION SOUGHT FOR OXY-FUEL DEMONSTRATION

"The Foundation would like to see a full-scale demonstration project launched in Texas, along the lines of what Praxair and Foster Wheeler have announced in New York" said McConnell.

"We believe Texas is perfect for this kind of project. Texas generates almost half of its electricity from coal, we have a need for much more electricity because of our growing population, and we are keenly interested in keeping our air as clean as possible.

"We would like to find Texas partners who are willing to pursue a demonstration project. Given its reliance on coal as a power source, its increasing demand for electricity and its innovative spirit, I think Texas would be perfect for a full-scale demonstration project," McConnell said.

Praxair's oxy-coal method uses a mixture of oxygen and re-circulated flue gas, rather than air, to combust the coal more efficiently, making it easier to capture the CO₂. By recirculating a portion of the

one approach:

OXYGEN KEY TO REDUCED EMISSIONS

Praxair's Oxy-Coal Technology Will Cut CO₂ by up to 90 Percent at Coal-Fueled Plants



Praxair Inc, an industrial gas manufacturer with a large Texas presence, is poised to launch demonstration projects that will incorporate clean-coal technologies and integrated oxy-coal combustion systems into coal-fueled generating, allowing these plants to capture and sequester carbon dioxide (CO₂).

Praxair signed an agreement with Foster Wheeler North America in September under which the two companies will pursue the demonstration projects.

Charles McConnell, chairman of the Foundation and Praxair vice president for gasification and oxy-coal technology, who is based in Houston, said the agreement "will help accelerate the development of oxy-coal combustion technology in the power-generation field, enabling use to contribute an environmentally friendly way to tap vast coal resources to meet our energy needs."

The companies have announced their first joint commercial development effort will be in Jamestown, N.Y. and Ciuden, Spain.

combustion stream with pure oxygen, the nitrogen that comes in with the air for the combustion process is eliminated, creating an exhaust gas that is a relatively pure stream of CO₂ that is ready for capture. This CO₂ is then compressed and transported by pipeline to an underground sequestration site.

The combination of the two companies' technologies and systems expertise would enable a coal-fueled generating plant to reduce CO₂ stack emissions by up to 90 percent, compared to a conventional coal-fueled plant of similar size.

Plants burning fuels such as biomass and petroleum coke as well as coal could see additional CO₂ emissions reductions.

Praxair has a long history of advancing oxygen-based combustion and gas-processing technologies that bring substantial productivity and environmental benefits to customers in many industries.

For the oxy-coal projects, Praxair will provide the upstream oxygen-supply facilities, applying its design, engineering and construction expertise in building large cryogenic air-separation plants that will provide the large volumes of oxygen necessary for clean-coal projects. Praxair also will provide the downstream CO₂-capture and gas-processing technologies equipment.

Praxair's control systems and integration capabilities also will be a key component of the project.

Foster Wheeler will develop and supply steam generators using oxy-coal combustion technology that can be installed in new or existing coal-fueled power plants.

A HIGHLY CONCENTRATED STREAM OF CO₂

Oxy-coal combustion creates a highly concentrated stream of CO₂ from a steam generator to facilitate carbon capture and sequestration. It is anticipated that the first applications of oxy-coal combustion technology will involve Foster Wheeler's circulating fluidized-bed (CFB) steam generators, which have gained global market acceptance for their efficiency, fuel flexibility, and relatively low emissions.

The oxy-coal combustion technology is expected to be applicable to pulverized-coal steam generators as well.

McConnell describes the planned New York demonstration project as unprecedented.

"This would be the first for the United States, and it's a really important milestone on which the United States needs to move forward. Only through demonstration projects like this can we get the right kind of road map to be able to advance technology like this and move into the future," he said.

The Clean Coal Technology Foundation of Texas plans to expend its resources to make local elected officials and economic development directors aware of the possibilities offered by these kinds of demonstration projects.

"These type of projects should be a win, win, win," said McConnell. "They're good for the environment, good for the local economy, and they help Texas meet its energy needs for the future."

The oxy-coal method uses a mixture of oxygen and re-circulated flue gas, rather than air, to combust the coal more efficiently, making it easier to capture the CO₂. By recirculating a portion of the combustion stream with pure oxygen, the nitrogen that comes in with the air for the combustion process is eliminated, creating an exhaust gas that is a relatively pure stream of CO₂ that is ready for capture.





a second approach:
REFINED COAL

K-Fuel Process Transforms Coal into Cleaner, More Efficient Fuel



The world needs more, cleaner energy now, but there is growing awareness about air emissions and the issue of climate change.

The solution to our energy and environmental needs requires an integrated approach that includes conservation, increased efficiency, expanded alternative and renewable energy production and expansion of traditional energy sources.

Clearly, coal will continue to be the major energy source for current and future electricity supply. Coal must therefore be made to burn as clean as possible as soon as possible.

There is near-term a solution, a commercial process that can provide energy, environmental and economic benefits to existing and new coal-fueled generation. It is refined coal.

EVERGREEN ENERGY

Evergreen Energy of Denver, Colo., produces K-Fuel®, a cleaner, more efficient refined coal using a patented pre-combustion process. K-Fuel is refined, or made cleaner, before it is burned to produce increased combustion efficiency and environmental benefits.

The K-Fuel process transforms abundant, low-rank coal into a cleaner and more efficient fuel.

Donna McDonald, executive director of the Clean Coal Technology Foundation of Texas, recently toured Evergreen's development facilities and K-Fuel plant in Gillette, Wyo. for a firsthand look at the company's innovative process and product.

"Evergreen's coal refinement technology could be a boon for energy producers in Texas because of our state's large lignite deposits. Evergreen's innovative process could apparently turn this abundant, but admittedly low-rank, form of coal into a cleaner, more widely used fuel source," McDonald said.

At the University of Norte Dame, a test burn of 100 percent K-Fuel in December 2006 yielded a 75 percent reduction in chloride emissions, a 90 percent reduction in sulfur dioxide emissions and a 75 percent reduction in mercury content compared to the raw feedstock.

Per kilowatt-hour generated, K-Fuel also burns with significant reductions in carbon dioxide, sulfur dioxide (acid rain) and nitrogen oxides (smog).

With K-Fuel's proprietary heat and pressure process, raw coal enters a large vessel that subjects it to higher temperatures and pressures, much like a pressure cooker. Coal is porous, not solid, and when exposed to the right combinations of heat and pressure it becomes malleable. The pores collapse and the heated water and polluting impurities are squeezed out, leaving K-Fuel with up to 70 percent less water than other low-rank coals and Texas lignite.

"EVERGREEN'S INNOVATIVE PROCESS COULD APPARENTLY TURN THIS ABUNDANT, BUT ADMITTEDLY LOW-RANK, FORM OF COAL INTO A CLEANER, MORE WIDELY USED FUEL SOURCE"

At the same time, the heat and pressure force

some of the coal's tars to its surface. This coats and seals the outside of the coal and helps prevent it from reabsorbing the lost moisture.

During the K-Fuel process the coal also undergoes a molecular change called "decarboxylation" that incrementally increases its heat content.

"A key challenge is to maximize energy production efficiency while minimizing carbon dioxide emissions. The use of K-Fuel will contribute to that goal," said Dr. Patrick Zimmerman, former director of the Institute of Atmospheric Sciences in Rapid City, S.D.

The reduced air emissions resulting from the use of the cleaner and more efficient K-Fuel can be achieved without major modifications to existing plants.

BOILER EFFICIENCY IMPROVED

K-Fuel's higher heat content also makes boilers more efficient. It can provide a lower-cost alternative to installing expensive, space-consuming, post-combustion pollution control systems, and it can make plants with existing emissions control systems operate more efficiently and cleaner.

In one particularly attractive scenario called K-DirectSM, the coal refinery is located next to an exiting or new coal-fueled power plant. The refinery uses the plants "letdown" or waste steam as a power source, and the power plant uses the refined coal in its boiler and the water removed from the coal in its cooling system. K-Direct is a good example of putting the concept of "combined heat and power" into practice to achieve even greater efficiency and lower emissions per kilowatt hour generated.

U.S. coal production is continuing to shift to western states as lower sulfur eastern coal shrinks in supply, rises in price and remains expensive to mine. K-Fuel provides near-term solution to utilities, regulators and policy-makers who understand the need to depend on coal but in a more environmentally acceptable way that maintains or reduces consumer costs.

K-Fuel can improve the energy, economic and environmental performance of this nation's most abundant domestic energy resource. It promises to make both an immediate and long-term impact on our nation's economic growth, energy efficiency and environmental quality of life.

another approach:
NEW, EXISTING FACILITIES CAN USE COMBUSTION TECHNOLOGY

AEP to Install CO₂ Capture Equipment on Existing Coal-Fueled Plants



In early 2007, American Electric Power (AEP) announced plans to install carbon dioxide capture (CO₂) technology on two of its existing, pulverized coal-fired power plants. The installations represent a validation, followed by the first commercial use of technologies to significantly reduce CO₂ emissions from existing plants.

"AEP has been the company advancing technology for the electric utility industry for more than 100 years," said Mike Morris, AEP chairman, president and chief executive officer. "This long heritage, the backbone of our company's success, makes us very comfortable taking action on carbon emissions and accelerating advancement of the technology. Technology development needs are often cited as an excuse for inaction. We see these needs as an opportunity for action."



TIME FOR COMMERCIAL APPLICATION

“With Congress expected to take action on greenhouse gas issues in climate legislation, it’s time to advance this technology for commercial use,” Morris said. “And we will continue working with Congress as it crafts climate policy. It is important that the U.S. climate policy be well thought out, establish reasonable targets and timetables, and include mechanisms to prevent trade imbalances that would damage the U.S. economy.”

AEP has signed a memorandum of understanding (MOU) with Alstom, a worldwide leader in equipment and services for power generation and clean coal, for post-combustion carbon capture technology using Alstom’s Chilled Ammonia Process. This technology, which is being piloted this summer by Alstom on a five-megawatt (thermal) slipstream from a plant in Wisconsin, is anticipated to first be installed on AEP’s 1,300-megawatt Mountaineer Plant in New Haven, W.Va., as a 60-megawatt (thermal), 20-megawatt (electrical) product validation in mid-2009 where approximately 100,000 metric tons of CO₂ is expected to be captured per year.

The captured carbon dioxide at Mountaineer will be designated for geological storage in deep saline formations at a depth of about 8,000 feet at the site. AEP has signed an MOU with Battelle Memorial Institute to serve as the consultant for AEP and continue the ongoing research on geological storage design, operations, and monitoring. This effort will build upon the extensive research at the site led by Battelle and funded by DOE National Energy Technology Laboratory, AEP, and other sponsors over the last five years.

TONS OF CO₂ TO BE REMOVED – AT JUST ONE PLANT

Following the completion of product validation at Mountaineer, AEP plans to install the Alstom system on an approximately 50 percent slip stream from one of the 450-megawatt (electric) coal-fired units at its Northeastern Station in Oologah, Okla. Plans are for the commercial-scale system to be operational at Northeastern Station around 2012. It is expected to capture about 1.5 million metric tons of CO₂ a year. The CO₂ captured at Northeastern Station will be used for enhanced oil recovery.

Alstom’s system captures CO₂ by isolating the gas from the power plant’s other flue gases and has the potential to significantly increase the efficiency of the CO₂ capture process by lowering the parasitic load on the power generating unit, when compared to other technologies used for CO₂ capture.

The Alstom technology provides a post-combustion carbon capture system that may be suitable for use in new plants as well as for retrofitting to existing plants. It requires significantly less energy to capture CO₂ than other technologies currently being tested.

AEP has also signed a MOU with The Babcock & Wilcox Company (B&W), a world leader in steam generation and pollution control equipment design, supply and service since 1867, for a feasibility study of oxy-coal combustion technology. B&W, a subsidiary of McDermott International, Inc., will complete a pilot demonstration of the technology this fall at its 30-megawatt (thermal) Clean Environment Development Facility in Alliance, Ohio.

PRE-COMBUSTION RETROFIT STUDIED

AEP and B&W are also conducting a retrofit feasibility study that will include selection of an existing AEP plant site for commercial-scale installation of the technology and the development of cost estimates to complete that work. Upon favorable results from the retrofit feasibility study, detailed design engineering and construction estimates to retrofit an existing AEP plant for commercial-scale CO₂ capture will begin. At the commercial scale, the captured CO₂ will likely be stored in deep geologic formations or used for enhanced oil recovery. The oxy-coal combustion technology would be scheduled to be in service on an AEP plant in the 2012-2015 timeframe.

By using pure oxygen instead of air, oxy-coal combustion excludes the nitrogen that is normally in the air and leaves a flue gas that is a relatively pure stream of carbon dioxide that is ready for clean-up, compression and storage.

The oxy-coal combustion process will use a standard, cryogenic air separation unit to provide relatively pure oxygen to the combustion process. This oxygen is mixed with recycled flue gas in Air Liquide’s proprietary mixing device to replicate air, which may then be used to operate a boiler designed for regular air firing. The exhaust gas, consisting primarily of carbon dioxide, is first cleaned of traditional pollutants, then compressed and purified before storage. B&W, working with Air Liquide, can supply the equipment, technology and control systems to construct the oxy-coal combustion and CO₂ compression and purification system, either as a new application or as a retrofit to an existing unit.

AEP anticipates seeking funding from the U.S. Department of Energy to help offset some of the costs of advancing these technologies for commercial use. The company will also work with utility commissions, environmental regulators and other key constituencies in states that have jurisdiction over the plants selected for retrofit to determine appropriate cost recovery and the impact on customers.

“We recognize that these projects represent a significant commitment of resources for AEP, but they are projects that will pay important dividends in the future for our customers and shareholders,” Morris said. “Coal is the fuel used to generate half of the nation’s electricity; it fuels about 75 percent of AEP’s generating fleet.”

AEP MOVING FORWARD ON CARBON CAPTURE

“By advancing carbon capture technologies into commercial use, we are taking an important step to ensure the continued and long-term viability of our existing generation, just as we did when we were the first to begin a comprehensive, system-wide retrofit program for sulfur dioxide and nitrogen oxide emissions controls,” Morris said. “We have completed the sulfur dioxide and nitrogen oxide retrofits on more than two-thirds of the capacity included in the program, and we are on schedule to complete all retrofits by shortly after the end of the decade.”

“By being the first to advance carbon capture technology, we will be well-positioned to quickly and efficiently retrofit additional plants in our fleet with carbon capture systems while avoiding a potentially significant learning curve,” Morris continued.

AEP A LEADER IN REDUCING AIR EMISSIONS

AEP has been among the leaders in the U.S. electric utility industry in taking action to reduce its greenhouse gas emissions. AEP was the first and largest U.S. utility to join the Chicago Climate Exchange (CCX), the world’s first and North America’s only voluntary, legally binding greenhouse gas emissions reduction and trading program. As a member of CCX, AEP committed to gradually reduce, avoid or offset its greenhouse gas emissions to 6 percent below the average of its 1998 to 2001 emission levels by 2010. Through this commitment, AEP will reduce or offset approximately 46 million metric tons of greenhouse gas emissions by the end of the decade.

AEP is achieving its greenhouse gas reductions through a broad portfolio of actions, including power plant efficiency improvements, renewable generation such as wind and biomass co-firing, off-system greenhouse gas reduction projects, reforestation projects and the potential purchase of emission credits through CCX.

“These projects represent a significant commitment of resources for AEP, but they are projects that will pay important dividends in the future for our customers and shareholders”



Texas Energy Solutions COAL REMAINS WORKHORSE OF ELECTRICITY PRODUCTION

By Barry T. Smitherman, Commissioner
Public Utility Commission of Texas

The population of the State of Texas may double by 2040.

The Electric Reliability Council of Texas (ERCOT) anticipates that peak electricity demand will reach almost 100,000 megawatts (MW) within 20 years from now. The present fleet of electric generating plants in ERCOT is anticipated to be inadequate to supply the needs of most Texans, with a prescribed reliability reserve margin, as soon as 2010. By 2027, we may need between 63 and 85 new gigawatts (a gigawatt is 1000 megawatts) of new electric generating capacity to meet the growing demand of Texas businesses, governments, and households. The seminal question of our day then becomes: "How do we meet this ever burgeoning demand for electricity in our state without accelerating potentially devastating climate change."

TEXAS EMBRACES ENERGY EFFICIENCY AND RENEWABLES

Some argue increased demand for electricity can be met through the deployment of greater energy efficiency, i.e. higher efficiency standards for home construction and appliances, and through demand response. According to their point of view, Texas can meet its future energy needs without building any additional nuclear, coal, or gas power plants, or any additional windmills or solar panels. While we can certainly do more in each of these more environmentally neutral areas, it simply is unrealistic to believe that energy efficiency and demand response will meet our future electricity needs. Even the *Austin American-Statesman*, in a recent editorial said, "It's doubtful that most Texans, including most Austin Energy customers, want to risk their economic well being – and air conditioning – on energy efficiency programs and wind turbines alone." Presently Texas is ranked No. 11 in energy efficiency.

Our signature program, which is ranked No. 1 and managed by the Public Utility Commission of Texas (PUCT), requires utilities to meet 10 percent of the future growth in demand through energy efficiency programs. House Bill 3693, passed in the 2007 legislative session, raises that figure to 20 percent by 2009. However, we are just talking about reducing the growth in demand, not reducing demand.



2007 Report on the Capacity, Demand and Reserves in the ERCOT Region - Summer Summary



Presently ERCOT manages a demand response program for large industrial and commercial users that provides 1,150 megawatts of capacity. While that is certainly helpful, it is important to remember that peak demand in ERCOT last summer was more

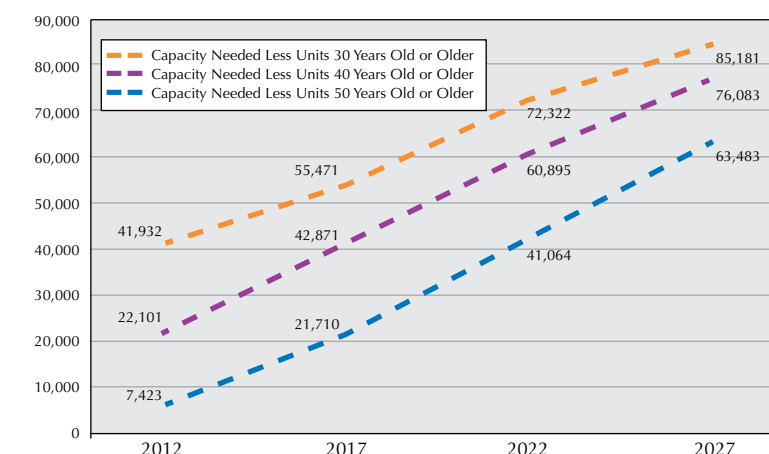
than 62,000 megawatts. The PUCT supports the concept of demand response and is working with the transmission and distribution utilities (TDUs) to aggressively deploy advanced meters for residential customers. TXU Electric Delivery, now called "Oncor", plans to install almost 3 million advanced meters by 2012. Likewise, CenterPoint, the TDU in Houston, plans to aggressively install advanced meters in 2008.

Once a home is provisioned with an advance meter, the consumer will be able to monitor real time electricity consumption and adjust that consumption during periods of peak pricing.

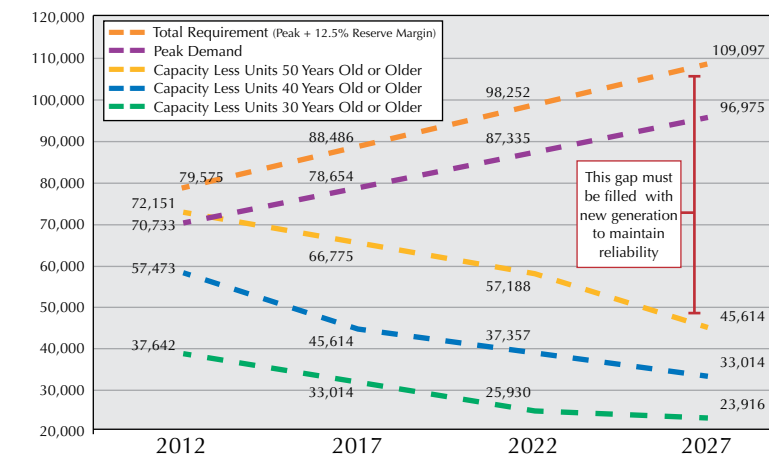
While demand response is a critical tool for a well functioning electricity market, it is important to note that demand response is somewhat of a paradox - high prices are required to sufficiently incent consumer demand response behavior.

Others assert that Texas' increased demand for electricity can be met through renewable generation resources like wind, solar, and biomass. Texas has become the leading state (recently surpassing California) for the generation of electricity from wind. Senate Bill 20, passed in the 2005 legislative session, establishes a goal of Texas receiving 10,000 megawatts of electricity from renewable resources, predominantly wind, by 2025 (though at our current pace we are likely to reach that level much sooner). The PUCT is moving aggressively to facilitate building billions of dollars of new transmission facilities required to deliver this wind generated electricity from where it is produced, mostly the Panhandle and west Texas, to where it will be consumed, mostly the Interstate 35 corridor and east. Because ERCOT is concerned with reliability, it discounts the capacity of wind generated electricity substantially and counts only 8.7 percent of nameplate capacity when calculating the electric generation resources that can be counted on during the hottest summer afternoon. While parts of Texas get lots of sun, and I am a supporter of solar - I have solar panels on my home in Austin - most experts agree it will be some time before solar becomes cost-effective on a commercial scale. Biomass, which also has great future promise, is just taking hold in Texas and presently makes minimal contribution to electricity supply.

Possible ERCOT Generation Capacity Needed



ERCOT Generation Capacity and Demand Projections



Generation units are typically retired after 30-50 years of service



“IT SIMPLY IS UNREALISTIC TO BELIEVE THAT ENERGY EFFICIENCY AND DEMAND RESPONSE WILL MEET OUR FUTURE ELECTRICITY NEEDS”

NUCLEAR STAGES A COMEBACK

Like others who spend their days (and nights!) worrying about the possibility of inadequate supplies of electricity in ERCOT in the not too distant future, I was thrilled to see NRG announce its intentions to file application for two new nuclear generating plants (perhaps San Antonio CPS and Austin Energy will join with them as well). The South Texas Project (STP) presently is the largest generating unit in Texas and had the best performance record of any nuclear plant in the United States in 2006. If all goes according to plan, STP 3 and 4 will join STP 1 and 2 and start producing electricity for Texans in the 2014-2015 timeframe. Both TXU and Exelon have announced their intentions to file application for a combined nuclear construction and operating license in Texas. If all three companies are granted permits and build new plants, it is possible that up to 10 new gigawatts of electricity could be generated from nuclear plants by say 2018. (While I am cautiously optimistic about the future of nuclear generation in ERCOT, it is important to note that groups such as Public Citizen, the Union of Concerned Scientists, Environmental Defense, and the Sierra Club are opposed to further nuclear deployment.) Unfortunately, using ERCOT's anticipated future 2027 demand numbers, this still leaves us significantly short of power.

NATURAL GAS: PREDOMINANT IN TEXAS

Natural gas, the predominant fuel source used to generate electricity in Texas, is likely to retain its preeminence for some time to come. Natural gas-fired generation is 72 percent of ERCOT's total generation capacity. While Texas has historically been blessed with ample supplies of natural gas, some experts believe we have reached the peak of domestic natural gas production. Many areas in the continental United States, the Gulf of Mexico, and the Atlantic and Pacific oceans remain closed by law to exploration and production. Liquefied Natural Gas (LNG) may hold promise for future supplies, however many people in the United States object to siting LNG facilities close to their homes and businesses, and much of the world's proven natural gas resides in countries such as Russia, Iran,

and Venezuela that are less than friendly to the United States. The price of natural gas of late has been high and volatile. At less than \$3 per MMBTU in 2001, gas prices rose to more than \$14 in the fall of 2005, only to fall back to about \$7.50 on the 12 month forward strip today. So long as Texas is heavily reliant upon natural gas for electricity generation, the price of natural gas will determine the price of electricity.

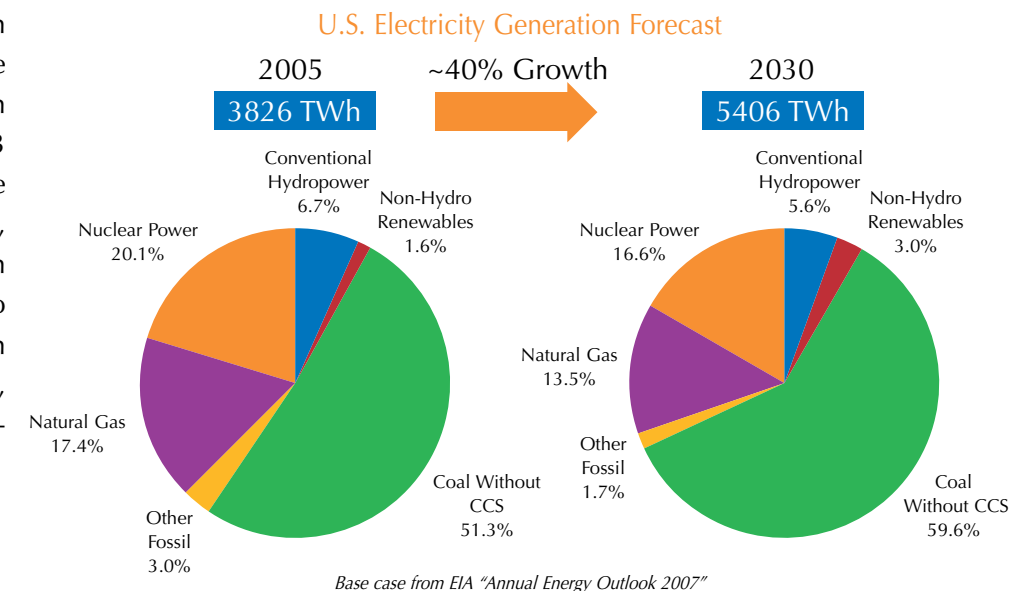
COAL: AN INDISPENSABLE ENERGY SOURCE

Coal, while much maligned and the present personification of evil to most environmentalists, is still the workhorse of electric production in the United States (and the world; reportedly China is building one new coal fired power plant a week) providing critical base load generation at relatively low prices. Constituting more than 50 percent of present production, most experts believe coal's contribution to electric production will increase, not decrease, over the next 30 years (or longer) regardless of assumptions about the development of carbon capture and sequestration (CCS). Because coal constitutes such a large percentage of present supply, and because the demand for electricity will rise so precipitously in Texas, the United States and globally, even with enhanced demand response, energy efficiency, and more renewables, the consumption of coal will likely increase both in absolute terms and in percentage terms.

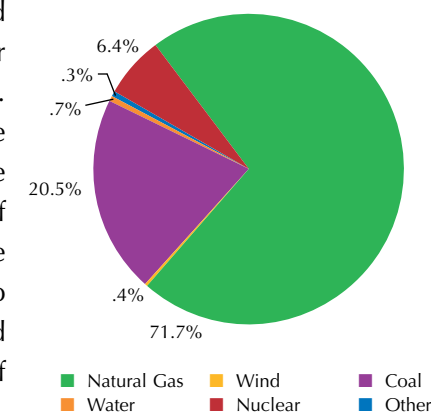
We need to face facts; coal will remain a valuable resource for generating electricity in our lifetime, if not longer. Coal provides much needed diversity and complements nuclear, natural gas, and renewable energy. Therefore, we must learn how to use coal in the cleanest way by investing in clean coal related technologies rather than succumbing to the increasingly conventional wisdom that coal-fired generation must be abandoned now and forever. The Lower Colorado River Authority (LCRA) and its partner in the Fayette coal-fired plant outside of La Grange, Austin Energy, have spent hundreds of millions of dollars to make those plants cleaner. Similarly, CPS's new Spruce 2, a 750 MW sub-bituminous pulverized coal plant presently under construction in San Antonio, will be demonstrably cleaner than all coal plants presently operating in Texas, and possibly all coal plants in the United States. FutureGen, a science, research, and development project that hopefully will be sited in Texas holds great promise for producing cheap and clean electricity from coal with carbon dioxide capture and sequestration. IGCC, plus other emerging technologies, such as catalytic gasification, oxygen-fired super critical pulverized coal, and pre-combustion heated and pressurized "K Fuel" hold great promise so long as we keep diligently pursuing them. Says GreatPoint Energy CEO Andrew Perlman, "Coal, to a lot of environmentalists, is a four-letter word. Our conclusion - and again, we came to this from an environmental perspective - is that coal is not going away. In fact, it's growing like crazy."

Well said Andrew, well said.

Barry Smitherman, of Austin, is a fourth generation Texan appointed by Governor Rick Perry to the Public Utility Commission of Texas on April 21, 2004 and reappointed on Sept. 13, 2007.



Summer 2007 Fuel Types - ERCOT





the role of coal
**INVESTMENTS MAKE ABUNDANT
RESOURCE EVEN CLEANER**

By Dr. Scott W. Tinker

A proposal in 2007 by TXU to build as many as 18 new pulverized coal power plants was challenged by a feverish public outcry. Some Texans did not want “dirty” coal plants dotting the state, even to produce much-needed electricity. Yet most Texans, and, in fact, most Americans, demand cheap energy in all forms. The “cheapest gas in town” is in the news daily. And on the campaign trail, one topic among leading contenders has been reducing electricity bills for the elderly. We face an interesting dilemma in the growing state of Texas. How do we light our homes and power our cars with energy that is both cheap and clean?

About 87 percent of energy is derived from fossil fuels: coal, oil, and natural gas. That percentage is up slightly from less than a decade ago. These natural resources are our most abundant and cheapest forms of energy. To date, other “clean” energy options (wind, solar, geothermal, tides), although growing substantially within the sector, cannot keep pace with overall energy-demand growth and therefore still only satisfy about 1 percent of global demand. In addition, although emerging energy technologies continue to evolve, cleaner energy is still intermittent and more expensive.

There is no free ride in energy; all forms of energy have some environmental impact and economic cost. Even with emerging technologies, it is clear that fossil fuels, including coal, are a mainstay for decades to come.

Because of the “Three-E Waltz” — energy, economy, and environment — attention is now being paid to reducing our carbon footprint, and coal is adapting to fit this mold. Integrated gasification combined cycle (IGCC) power plants with CO2 capture and storage are being considered globally. FutureGen is the U.S. version of such a facility, and Texas is one of two states remaining in the national competition to win FutureGen.

AN ENERGY PARADOX

In the meantime, electricity is needed to sustain our economy so that substantial investment can be made on research for cleaner technologies. Quite a paradox: the transition to cleaner technologies will depend on our willingness and ability to use our current fossil resources.

As a major source of power for the foreseeable future, coal has a strong tradition in this country. Mines are a part of the history of America, and economies of hundreds of small towns around the country continue to be sustained by coal.



The FutureGen Alliance leadership meets with the Texas FutureGen team following a September planning meeting in Austin. Front row from left: Chuck McDonald, Texas Railroad Commission Chariman Michael L. Williams, Alliance CEO Mike Mudd, State Geologist Dr. Scott W. Tinker. Standing from left: Steve Walden, Monty Humble, Jay Stewart, Sharon Campos, Jerry Oliver, Carol Treadway, Ken Humphreys, Lucy Swartz, Jerry Hill, Tres Cochran and Jay Kipper

emissions can be satisfied. These same talented, educated minds could go on to develop new ideas that will push the coal industry to a cleaner standard, as well as push emerging energy forms to an affordable standard.

Maybe it's not such a paradox after all, but instead more of a symbiotic relationship — one growing out of a need for the other.

THE NEED FOR ENERGY

All citizens must step back and understand the great need for energy. This energy can power the economy, and a healthy economy will provide continuing opportunities to help our environment. The Hollywood hype created by documentaries and overzealous political figures, although entertaining, should not be confused with solutions.

There is a great need for partnerships between universities, government, industry, and communities. Carrots, such as tax incentives, streamlined permitting and environmental policies, must be balanced carefully with sticks, such as carbon taxes, cap-and-trade schemes, and regulation, in order to lead someday to affordable and cleaner energy. Sticks, when hastily and unilaterally applied, have a track record for unintended negative consequences.

COAL: A NECESSARY RESOURCE

The role of coal in our society is clear. It's a necessary resource — cheap, efficient, and abundant — that will keep our homes energized for years. With the right investment in research and technology, coupled with properly balanced incentives and carbon policies, the coal industry could add *increasingly clean* to that list.

Dr. Scott W. Tinker is Director of the Bureau of Economic Geology at the University of Texas at Austin, the State Geologist of Texas, and a Professor holding the Allday Endowed Chair in the Jackson School of Geosciences at the University of Texas at Austin. Tinker leads the FutureGen Texas Team. He spent 18 years working in the oil and gas industry prior to coming to UT. He holds appointments on the National Petroleum Council, National Research Council Board of Energy and Environmental Systems and the Interstate Oil and Gas Compact Commission.

COAL: RELIABLE, EFFICIENT, CHEAP

Along with the “dirty” reputation of coal comes a reliable, efficient, and cheap source of power to light our homes, and the economy depends on affordable, reliable energy. The 18 power plants proposed by TXU came as a shock to Texans. And yet China continues to lead the world in coal-plant energy production, building a new coal plant a week—on the order of 500 in the next two years.

If the economy does well, more residents enroll in postsecondary education, pursue independent research, and take an interest in their community. If more scientists and engineers are produced, the need for advanced research in lowering carbon



“There is no free ride in energy... all forms of energy have some environmental impact and economic cost”



POWER PLANT PERMITTING DECISIONS SHOULD BE DRIVEN BY SCIENCE

By Erich Birch

It is really remarkable that a dark room can be filled with light at the flip of a switch. Most people would agree it is a good thing to have an adequate and reliable supply of electricity so that when we flip the switch, the lights actually come on.

Likewise, most people would agree electricity needs to be affordable, otherwise electricity becomes a luxury the full benefits of which may not reach those people living on low or fixed incomes.

Most people would also agree electricity needs to be generated in a manner that is protective of health and the environment; after all, we all live here. With all of this agreement, it is therefore interesting that there is such sharp disagreement on how best to make electricity that is at the same time reliable, affordable, and protective of the environment.

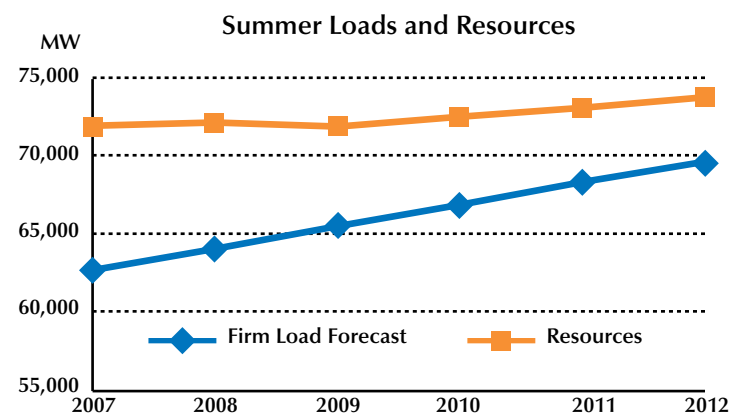
Texas must construct new generation facilities over the next few years in order to meet projected increases in electricity demand. For electric power providers, policy-makers, and consumers this raises the important question: How should we generate electricity in Texas? Just as importantly, we must also ask ourselves: What is the proper role for the state to play in the permitting process for these vital facilities?

There seems to be a disconnect between expectations that we should have dependable and affordable electricity and beliefs about the processes and fuels used to generate the electricity. However, in order to meet the projected energy needs of the state, the competing environmental, health, economic, and practical interests suggest that a mix of processes and fuels will be needed.

The Electric Reliability Council of Texas (ERCOT) projects that the reserve margin, a measure of the available electric generation capacity compared to the electricity needs of the state, will experience a significant drop over the next few years. The reserve margin is important because it gauges whether there is sufficient capacity to provide uninterrupted electric power during critical times of need. Figure 1 shows the anticipated rise in electricity demand (identified as "Firm Load Forecast") versus all available sources of electricity generation (identified as "Resources") for summer months, which is when electricity demand is highest.

ELECTRIC RESERVE MARGIN THIN

According to ERCOT, the margin should be at least 12.5 percent to reliably meet the state's energy demands. Instead, the figure graphically shows reserve margins are expected to drop from the current 2007 level of 14.6 percent to only 5.9 percent in 2012. The 2012 capacity figure includes all anticipated available electricity capacity in the state, including units that have been permitted but have not yet been built. The figure does not



Source: ERCOT Report on the Capacity, Demand, and Reserves in the ERCOT Region, May 2007.

include units that have been proposed but do not yet have the required permits.

So the question for Texas is how do we maintain the recommended reserve margin of 12.5 percent? In other words, how do we ensure the lights will still come on when we flip the switch?

VARIETY OF FUEL SOURCES NEEDED

The electricity generated in Texas comes from a mix of fuels. According to ERCOT, natural gas produced 46 percent of the electricity in Texas in 2007; coal, 37 percent; nuclear, 14 percent; wind, 2 percent; other 0.5 percent; and water, 0.2 percent. ERCOT projects this profile will not change over the next five years. Clearly, Texas will need generation from each of these sources as it faces a growing demand for electricity.

All forms of electricity generation have advantages and disadvantages. There are no perfect solutions.

By the time the application for an environmental permit is submitted to the regulatory agency, significant financial and time investments have already been made, and there have been detailed technical reviews and evaluations of processes and fuels. Once submitted, the regulatory evaluation of the proposed plant should be focused on the issue then at hand: Will this proposed facility meet applicable environmental permitting standards which have been developed to protect the environment?

UNRELATED ISSUES HAMPER PERMITTING PROCESS

At times, the permitting process is instead sidetracked over issues unrelated to the particular plant under consideration, for example, the choice of fuel for the proposed plant.

When viewed in terms of the plant's impact on air quality, arguments over a particular process or fuel are really "red herring" issues. Whether or not a permit for a power plant – or for that matter any other type of facility – is approved should be based on the bottom line issue of whether the emissions from the plant will be protective of health and the environment. Federal and state regulations mandate a painstaking procedure for evaluating the potential impacts of emissions from a facility. There are primarily three ways this is accomplished. First, the plant must use the best technology available for the selected process, and in many cases, must also meet specific technical requirements stipulated by regulation. Second, the emissions from the plant are evaluated to ensure there are no adverse impacts to health or the environment from this individual plant. Third, the emissions from the proposed plant are evaluated in combination with emissions from other sources in the area to make sure there is no degradation of the ambient air quality.

Some opposition to proposed power plants should be recognized for what they are: solely philosophical objections. From a scientifically objective view point, if a facility can meet all three prongs of the federal and state review, then the permit should be granted. A similar philosophical debate involves the particular process used to generate electricity from a fuel.

This issue was most visible in the past year during the permitting of several coal-fired power plants utilizing the pulverized coal (PC) process. A debate arose whether the use of the PC process to produce electricity from coal was the most environmentally protective process, or whether the integrated gasification combined cycle (IGCC) process should be used instead. In air permitting terms, this question was framed as whether the PC process was Best Available Control Technology (BACT) for a coal-fired plant. The Texas Commission on Environmental Quality (TCEQ) ultimately determined that IGCC and PC were different types of processes, that an applicant may select a particular process based on many different factors, and that once a particular process is selected the applicant is then required to use BACT for that process.

Again, if the facility protects the environment and it meets regulatory requirements, the permit should be granted.

Texas will need new electric generation to meet its needs over the next several years, and we should expect and demand that each plant meet federal and state standards designed to protect the state's environment. Discussions for new electric generation plants for the state include gas, coal, wind, nuclear, and various innovative technologies. Good. These might come in really handy when we flip the switch five years from now.

Erich Birch is a partner with the Austin law firm of Birch, Becker & Moorman, L.L.P., where he handles matters involving air quality, industrial waste, environmental audits and other environmental permitting and regulatory compliance issues.

American Conference Institute presents:

Carbon Capture and Storage

Exploiting the Commercial Viability of CCS: Stake your Position to Capitalize on Future Revenues

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The American Conference Institute (ACI) presents its inaugural conference on Carbon Capture and Storage. This event, presented in conjunction with the Clean Coal Technology Foundation of Texas (CCTFT), is the only event in the industry focusing on the commercial viability of CCS. With new emissions legislation being enacted and future mandates on the horizon, energy companies are striving to identify investment strategies in this field. Hear about new technologies and projects and seize your opportunity to network with industry leaders.

CONFERENCE HIGHLIGHTS INCLUDE:

- An exclusive CCTFT panel featuring Rick Hardcastle, Chairman of the Texas House Energy Committee and Author of HB3732
- Gain insight into liability issues pertaining to sequestration from Kipp Coddington of Alston & Bird
- Representatives from American Electric Power, including Mike Hammond, who was quoted on a front page July 12, 2007 article in the Wall Street Journal as they discuss the success of their CCS projects
- Witness the FutureGen debate (Illinois versus Texas) just as the DOE prepares to announce which site will be awarded the project
- Get an in-depth look at CO2 for enhanced oil recovery and the financial benefits behind these projects at our post-conference workshop

PLUS

Featuring Keynote Speakers:

Michael Williams
(Texas Railroad Commissioner)

and

Thomas J. Feeley, III
Division Director
Energy and Climate Division
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Group discounts available!

ABOUT THE REPORT

Since its inception in 2004, the Clean Coal Technology Foundation of Texas has worked to move the discussion forward on how best to secure Texas' energy future.

Finding Solutions 2008 is the third in a series of publications over the last two years examining state energy needs. All three publications: *Making Progress 2006*, *Power Outage 2007* and *Finding Solutions* are available at www.cleancoalfoundation.org.

The Foundation recognizes there are a lot of possible solutions out there for meeting our growing demand for electricity while protecting our environment and ensuring economic growth. Conservation, energy efficiency, renewables and nuclear power, as well as the more traditional fuel sources such as coal and natural gas, all have a place as we face this complex challenge.

Every day energy technology advances. The value of this progress, however, is diminished unless that technology can be economically converted to widespread, commercial use that benefits consumers.

Enter House Bill 3732, which is the feature story in *Finding Solutions 2008*.

The Foundation views this legislation as one of the most exciting long-term solutions because it is designed to attract new energy companies and projects to Texas and to spur companies already in Texas to retrofit or build additional advanced clean energy plants.

ABOUT THE CLEAN COAL TECHNOLOGY FOUNDATION OF TEXAS

The Clean Coal Technology Foundation of Texas was founded in January, 2004, as a non-profit entity to promote the use and development of clean coal technologies that will result in reliable, low cost, and environmentally responsible energy for Texas. Foundation members are:

- | | |
|---|-----------------------------|
| AEP Texas | Arch Coal, Inc. |
| The Center for Energy and Economic Development (CEED) | Evergreen Energy, Inc. |
| Lower Colorado River Authority (LCRA) | Peabody Energy |
| Praxair, Inc. | Millennium Synfuels, LLC |
| North American Coal Corporation | Russell & Sons Construction |
| TXU | Westmoreland Coal Company |

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Editing and Research
Rickey Dailey

Graphic Design
Dena Steiner

Copy Editor
Hal Harris
Brittany Fish

Photography
Larry Jones

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807 BRAZOS, SUITE 710
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