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# Clean Coal: A Wise Path Forward

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## Talking Points

- Advanced emission control technologies have dramatically reduced major environmental impacts from coal-fired generation.
- A new generation of technologies under development herald a second generation of even cleaner coal power.
- It is unrealistic to suppose we can supplant coal generation in the next 20 years without jeopardizing economic health and quality of life.

In a modern economy, electric power functions like a person's nervous system. Adequate supply of cost-efficient power is necessary to any prospering economy and basic quality of life.

Policy decisions impacting energy sources must support basic reliability, affordability, and supply necessary for electric generation. Too often, the inexorable rate and scale of growth in energy demand is not fully reflected in new energy policies. Environmental policy should enhance—but cannot supplant—the fundamental dynamics of securely available, cost-efficient energy.

Without coal in the energy mix, sufficient electric generation to meet future Texas, national, and global demand is doubtful. Although frequently maligned as a source of air pollution and green house gasses, coal remains fundamental to current and future electric generation in the U.S. and Texas. In the U.S., and particularly in Texas, advanced emission control technologies have dramatically reduced major environmental impacts from coal-fired generation. A new generation of technologies under development herald a second generation of even cleaner coal power.

The scale of coal's contribution to the U.S. power supply is often lost in policy debates about energy. Replacing the electric power the U.S. currently derives from coal is simply not feasible in the foreseeable future, and coal's global role dwarfs that in the U.S. Coal-based generation is driving the rapid economic development of China and India on an unprecedented scale. At a rate of around one new plant per week, China built more coal-fired plants in 2007 than Great Britain built in its entire history.[1]

Coal is the source of half the electric generation in the U.S. and approximately one-fifth in Texas.[2] According to the Electric Reliability Council of Texas (ERCOT), coal accounts for 22 percent of installed generating capacity, but provides 37 percent of electricity consumed because coal powers "base load" plants which operate continuously. With over 9 percent of total U.S. consumption, Texas consumes far more coal than any other state.[3]

Although highly promoted by federal and state subsidies and incentives for decades, alternative energies, including wind, accounted for less than 2.5 percent of U.S. electric generation in 2007. Wind alone contributed just 0.77 percent nationally and 2 percent in Texas.[4] Although most new generation capacity in the last 20 years was from natural-gas-fired plants, the volatile price and competitive international demand for natural gas precludes unlimited future use of this source. Nuclear takes time and is highly capital intensive. Coal, alone, remains poised to provide a reliable, highly affordable, domestically-abundant source of needed electric generation.

Frank Clemente, Senior Professor of Social Science & Energy Policy at Pennsylvania State University, calls coal the "cornerstone of electricity generation in the U.S." According to Professor Clemente, in order to replace coal as a source of power generation, any of the following would be required: an additional 250 nuclear reactors, an additional 17 trillion cubic feet of natural gas, or 500 hy-

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dropower facilities the size of the Hoover Dam.[5] Professor Clemente underlines the need for more coal, but also for other energy resources, forecasting that all of the following increases are needed in order to meet energy demand in 2030: nuclear power (38 percent), oil production (43 percent), renewable energy (61 percent), natural gas production (64 percent), and coal production (74 percent).[6] It is unrealistic to suppose we can supplant coal generation in the next 20 years without jeopardizing economic health and quality of life.

Ten new coal-fired power plants are under construction or planned nationally, five of them in Texas. Activist campaigns, however, have defeated or indefinitely delayed permits for perhaps 20 new coal-fired plants across the country. This impasse led the National Electric Reliability Council to reduce reliability ratings in several states. Although neither federal law nor rule now mandates carbon dioxide ($CO_2$) reduction, activist judges and/or the perceived inevitability of $CO_2$-reduction mandates make the future of coal—our nation's most readily available, inexpensive source of electricity—uncertain.

## Clean Coal: A Wise Path Forward

New control technologies of the last decade have dramatically reduced emissions of conventional pollutants like sulfur dioxide, nitrogen dioxides, particulates, and mercury from coal-fired power plants. New coal plants equipped with cutting-edge technology, and retrofits of existing plants, have contributed to major improvement in the air quality of Texas and other regions.

The second generation of clean-coal technologies are rapidly emerging but are not yet ready for broad commercial-scale use. Technologies that can capture, store, and productively use the $CO_2$ emitted during coal-fired power generation are under development, as are technologies such as gasification and coal-to-liquids with the potential for extracting diverse, valuable products from energy-dense coals through almost zero-emission processes.

For example, Ambre Energy is working on the commercialization of two clean-coal technologies: (1) a hybrid energy system for the low temperature pyrolysis of coal to produce a clean burning, high energy, solid char product and synthetic crude oil; and (2) gasification of coal to produce a hydrogen-rich syngas for conversion to a next-generation fuel (dimethyl ether) and clean power.[7] Peabody Energy is pursuing coal-to-liquids and coal-to-gas projects. ConocoPhillips is developing a gasification project at its Sweeny refinery in Brazoria County, Texas, utilizing its proprietary E-Gas™ gasification technology which "converts petroleum coke or coal to syngas containing mainly hydrogen and carbon monoxide." This can be used as a fuel for electrical power and steam generation, then converted to pure hydrogen, ammonia, methanol, substitute natural gas (SNG), or other chemicals in a safe and environmentally friendly manner."[8]

Carbon capture and storage (CCS) is the process of capturing certain amounts of $CO_2$ from the coal-fired generation process before release into the atmosphere. Once captured, the $CO_2$ can either be stored—often in underground saltwater reservoirs—or put to a commercial use. Captured $CO_2$ can be put to productive industrial use, as in enhanced oil recovery (EOR) in the Permian basin. Texas has three decades of experience in using EOR to recover oil that would otherwise be left in the ground using conventional production methods.

EOR has contributed significantly to the Texas economy and could be used on a much broader scale using $CO_2$ captured from coal-fired power plants. Texas also has the geological capacity, not found elsewhere, for storage of massive volumes of $CO_2$ underneath our coastal waters and in underground brine deposits. At the University of Texas, the Bureau of Economic Geology has determined that Texas' coastal waters provide a suitable underground $CO_2$ depository that could store all of the man-made $CO_2$ that the U.S. could produce for 1,000 years.

Many unresolved challenges, however, must be addressed before CCS can become an established commercially-viable technology for large scale deployment. Existing pipeline systems are inadequate. In order to accommodate large-scale $CO_2$ transport, an extensive network of $CO_2$ pipelines must be built because $CO_2$ corrodes typical pipelines carrying gases, oil, and/or water.

A major economic issue is the "parasitic load" caused by most technically viable CCS technologies. This is not a new challenge to the power industry. Emission control equipment to capture ash, sulfur dioxide, and nitrogen oxides require electricity to operate. In many cases, more efficient plant design and operation yielded some, or all, of the power needed to operate the emission controls. With current technology, $CO_2$ capture might utilize one-fourth to one-half of power plant generation. This means a plant

with an installed capacity of 800 MW might only have 400 to 500 MW of electricity to sell—enormously increasing the cost of the electricity.

Finally, CCS remains expensive. Commercial viability of CCS, on the scale large enough to power major population and industry centers, could be years or even decades away. Studies conducted by the U.S. Department of Energy conclude that CCS with today's technologies would result in electricity costs from 30-90 percent higher than new coal plants without CCS.

Dan Kammen, University of California's Berkeley Institute of the Environment, writes, "The problem is that, as we've done more and more research on carbon sequestration over the last few years, the price tag to sequester safely and reliably that carbon has been increasing ... Per ton of carbon, the price is looking about twice as high now as it was a couple of years ago to dispose of it. And we aren't quite clear on how we're going to do it at scale and how we're going to transport the $CO_2$, not only above ground to the places where we'd bury it, but to then bury it geologically safely and monitor it. There are a whole range of barriers in place."[9] However, as the technology advances and as companies increase their operational efficiency, the cost of CCS could fall over time.

Innovation, technology, and private-sector investment in clean technologies appear critical for continued use of coal as a vital energy source, and the power industry has already made significant investments. According to the American Coalition for Clean Coal Electricity, more than $6 billion of clean-coal research is taking place in 41 states. In Texas, 12 clean-coal demonstration projects are underway, totaling $37 million in investment.[10]

Without coal, electricity will likely cost much more—even more than coal-fired generation with the added cost of carbon capture. Over the last decade, federal and state governments have provided generous incentives for the development of renewable energy and alternative fuels, but have not comparably supported clean coal. Texas geology, active enhanced oil recovery, and emerging technology resources create unique economic, environmental, and energy advantages for clean-coal technology development of value to Texas, the nation, and indeed the entire world.

The Texas Legislature has passed a number of bills to advance clean-coal technologies, most notably House Bill 3732 (2007), an advanced clean-energy bill that created financial and regulatory incentives for certain emission-reducing projects.

## Recommendations

As Texas' policymakers prepare for the 81st session, they should be guided by the following principles to assure reliable and affordable electricity to Texas' consumers:

- Clean-carbon projects require vigorous cost-benefit analyses. Analyses of the potential burdens and benefits to electric ratepayers and taxpayers should be completed.
- Realistic assessments of potential technologies must support, and realistic time frames must apply, to all legislative actions.
- The market is best suited to pick energy winners and losers. Certain energy resources and technologies should not be shown favoritism over others. Incentives should not distort the market.

## Endnotes

[1] "Energy Realities Facing the United States," Dr. Frank Clemente, Penn State University, from a presentation given to the Texas Legislature Carbon Management Caucus (27 Jan. 2009). Sources: Platt's Proprietary Database 2008; I.E.A., 2007; E.I.A. 2008.

[2] EIA, Basic Coal Statistics, http://www.eia.doe.gov/neic/quickfacts/quickcoal.html.

[3] Electric Reliability Council of Texas, 2008 Energy Report.

[4] "Electric Power Monthly," EIA (June 2008) http"//www.eia.doe.gov/cnf/electricity/emp/emp_sum.html.

[5] Supra note 1.

[6] Ibid.

[7] For more on Ambre Energy's technologies, see http://www.ambreenergy.com/WhatWeDo/Technology.aspx.

[8] "Emerging Businesses," ConocoPhillips, http://www.conocophillips.com/about/worldwide_ops/major_businesses/emerging_businesses/emerging.htm.

[9] "High Hopes for Clean Coal?" *Frontline, PBS* (21 Oct. 2008) http://www.pbs.org/wgbh/pages/frontline/heat/themes/cleancoal.html.

[10] Texas Legislature Online, http://www.legis.state.tx.us/billlookup/text.aspx?LegSess=80R&Bill=HB3732. See also "Understanding and Working with the Current Incentives for CCS in Texas," Michael J. Nasi, Jackson Walker L.L.P.

## About the Author

**Kathleen Hartnett White** joined the Texas Public Policy Foundation in January 2008 as Director of the Center for Natural Resources.

Prior to joining the Foundation, White served a six-year term as Chairman and Commissioner of the Texas Commission on Environmental Quality (TCEQ). With regulatory jurisdiction over air quality, water quality, water rights and utilities, and storage and disposal of waste. TCEQ's staff of 3,000, annual budget of over $600 million, and 16 regional offices make it the second largest environmental regulatory agency in the world after the U.S. Environmental Protection Agency.

Prior to Governor Rick Perry's appointment of White to the TCEQ in 2001, she served as then-Governor George Bush's appointee to the Texas Water Development Board, where she sat until appointed to TCEQ. She also served on the Texas Economic Development Commission and the Environmental Flows Study Commission.

A writer and consultant on environmental laws, free market natural resource policy, private property rights, and ranching history, White received her bachelor cum laude and master degrees from Stanford University where for three years she held the Elizabeth Wheeler Lyman Scholarship for an Outstanding Woman in the Humanities. She was also awarded a Danforth National Fellowship for doctoral work at Princeton University in Comparative Religion and there won the Jonathan Edwards Award for Academic Excellence. She also studied law under a Lineberry Foundation Fellowship at Tech University.

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