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Power for the Future: The Debate Over New Coal-Fired Power Plants in Texas

by **H. Sterling Burnett, Ph.D.**
Senior Fellow, National Center for Policy Analysis

INTRODUCTION

Texas has prospered in recent years. The state's population and economy have grown at a steady pace, and estimates are that this growth will continue. Arguably, one reason for Texas' continued economic progress was its successful deregulation of the electric industry. While several other states' attempts at electric deregulation faltered, Texas' deregulation brought needed new power capacity to the market. This tempered, in part, energy price increases that occurred due to the significant rise in natural gas prices—on which the state has over-relied.

Continued economic growth, and the prosperity it brings and spreads, relies upon continued growth in available power. Despite improvements in efficiency allowing ongoing improvements in the amount of Gross National Product (GNP) and Gross Domestic Product (GDP) per unit energy used, the world has yet to discover a way to decouple continued economic growth from increased power use. Based on forecasts by the Electric Reliability Council of Texas (ERCOT),[1] Texas needs both more baseload capacity—power supplied regularly to the system for normal operation—and peak capacity—power available when usage surges beyond the amount needed on most days (in Texas this usually means on the hottest days during the summer). Absent new supplies, Texans could face even higher prices and periodic, increasingly frequent outages. While there are several possible fuel sources for generating baseload power, coal is the least expensive source of reliable power that can be brought to market in the short-term. To address Texas' future energy needs, companies had proposed building as many as 16 new coal-fired power plants in the next decade. However, attacks on these new plants led to plans for eight of those plants to be scuttled. Others, recognizing Texas' strong need for new generation, have proposed replacing at least some of the plants pulled from the table.

There are two main concerns raised by the opponents of coal-fired plants. The first is that the plants will increase air pollution in the Metroplex and surrounding areas, harming human health and making it harder to be in compliance with federal clean air standards. The second is that the plants will emit large quantities of carbon dioxide and contribute to global warming.

Opponents also argue that there is no need to build new traditional coal-fired plants to meet Texas' growing energy needs—that there are alternatives that will take care of this need. They argue that we can meet our electricity needs by building plants which incorporate clean-coal technologies like IGCC and carbon sequestration now, and by implementing demand management and conservation measures.

This paper will examine these claims in the context of what Texas must do to meet its short- and long-term electricity needs.

THE NEED FOR NEW POWER

Texas has been one of the fastest growing states in the nation for a number of decades. Since 1970, Texas' population has grown from 11.2 million people to more than 23.5 million. Texas' population is expected to keep growing to an estimated 40 million by 2030 and 50 million by 2040.[2] Job growth, including in the energy intensive chemical manufacturing and refining industry—of which Texas accounts for a disproportionate share compared to the nation as

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900 Congress Avenue
Suite 400
Austin, TX 78701
(512) 472-2700 Phone
(512) 472-2728 Fax
www.TexasPolicy.com

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Texas is estimated to need between 48 and 63 percent more energy by 2025.

a whole—is also expected to continue. If these estimates are correct, at a modest 2 percent annual growth rate in demand, ERCOT—the independent organization charged by the Legislature with ensuring the reliability of the electric grid for 75 percent of the state (area wise) and 85 percent (load wise)—has estimated that by 2015, Texas will need 22 percent more power at peak times and 21 percent more power in general.[3] This estimate might be low, however, since ERCOT has reported that peak demand actually increased about 2.5 percent per year between 1990 and 2006 and it has estimated that demand is expected to increase by 2.3 percent between 2007 and 2012.

Looking farther out, since power plants are long-term investments, Texas is estimated to need between 48 and 63 percent more energy by 2025—and that is before accounting for the scheduled and/or anticipated retirement of older power plants. As early as 2010, Texas will need an additional 500 MW of power generation to replace power from power plants that are 50 years old or more as they are shuttered.[4] By 2015, Texas, with a modest growth in demand of 2 percent, will need between 7,000 MW of new peak capacity if only power plants 50 years or older are retired and 48,000 MW if power plants 30 years and older are retired. This need for new capacity only grows as the time horizon expands. By 2025, as older power plants are shutdown, Texas will need as much as 79,000 MW of new peak capacity. Growth in normal operating demand would only be slightly lower. And this is just in the ERCOT territory. Demand is also expected to grow in other regions of the state.

Were it not for Texas' recent electricity deregulation, the supply situation might already be much worse. Since 1995, 37,063 MW of new generation have been added to the Texas market (the vast majority of which was natural gas-fired capacity).[5] As of November 2007, an additional 4,443 MW were under construction (1,050 MW of coal, 1,478 MW of wind, and 1,905 of natural gas).[6] This capacity was added in a relatively short time period because under Texas' deregulation most of the regulatory burdens (applications, paperwork, and approval processes) went away, allowing companies to add capacity as needed at a price that would make it worth their while to make such expensive, long-term investments.

Some have argued that the recent rise in energy prices in Texas shows that electricity deregulation has not worked as promised—bringing competition and lower prices—but this analysis is faulty. Concerning competition, Texans have more than 16 different electric providers to choose from offering 53 different electric plans. Texas electric providers compete on price and much more—including, types of billing and service options and the guaranteed "renewable" power, for instance. As a result, by early 2007 approximately 68 percent of commercial and industrial users had switched their electric providers, and more than 30 percent of residential users had switched (some having switched more than once).[7]

As noted above, almost all of the new electric generation capacity added since deregulation occurred was natural gas. Texas is not unique in this regard. Nationwide, for a number of reasons, throughout the 1990s and the early 21st century, the federal government promoted natural gas as the fuel of choice for the future. For reasons discussed below, the increase in the use of natural gas for electric generation caused a substantial, sustained rise in the price of gas. However, despite a 200 percent increase in the price of natural gas, the average price of electricity is less than 25 percent higher than the regulated price in 2001. Thus, absent competition and the increased capacity, the price situation could have been much worse than it is.

DIVERSITY OF ENERGY IS THE KEY

Each of the currently available sources of power has both economic and environmental benefits and risks attached to them. But what has become apparent in recent years is that the key to a reliable, relatively inexpensive and clean power supply is a diversity of types of generating resources.

Baseload power plants are the key to energy reliability. They supply a steady flow of power regardless of total demand by the grid. These plants are typically large enough to supply much of the power used by a grid, but making them slow to start up, fire up, and cool down, as a result, they run at all times through the year except in the case of repairs or scheduled maintenance.

Sufficient baseload power is the key to reliability and only a few power sources match the requirements needed to provide baseload power. In Texas these are coal, nuclear, and natural gas. For reasons discussed below, despite the significant growth in wind power as a source of electricity in Texas, it cannot serve as a baseload power source.

Texas, as compared to much of the nation, doesn't have much energy diversity for baseload power. Rather, Texas has put most of its energy eggs in the natural gas basket, and with the recent rise in gas prices this has meant higher energy bills for Texas consumers, businesses, and industries.

Coal-fired power plants make up 33 percent of the electric power generating capacity in the United States, and provide over 52 percent of the electricity. Although, in Texas, coal power makes up just 19 percent of electric capacity, and provides more than 40 percent of the state's electric power on an annual basis.[8] Alternatively, for the nation as a whole, natural gas and oil combined account for 45 percent of total generating capacity, while in Texas it accounts for a dominant 72 percent, and generates 43 percent of the electricity (for the U.S. as a whole the rate is even lower). Texas also has two nuclear power plants which, because of the operating efficiency of nuclear power plants, provide as much as 11 percent of the electricity produced, even though they account for only 6 percent of the state's capacity.

NUCLEAR POWER: PROMISE FOR THE FUTURE, BUT NOT THE SHORT-TERM

Nuclear power has an unparalleled safety record, but the accident 28 years ago at Pennsylvania's Three Mile Island nuclear power plant brought the construction of new reactors to a standstill.[9] Still, nuclear power has not been dormant. The 103 operating nuclear reactors generate approximately 20 percent of the nation's electricity. Given forecast energy demand, positive changes in the nuclear power industry, relatively high, wildly fluctuating fossil fuel prices, and environmental concerns, nuclear energy likely will grow as a percentage of the nation's energy mix.

Nuclear power has many virtues to recommend it as a baseload source of electricity, including high operating efficiency, low operating costs, and a large domestic source of nuclear fuel. In addition, nuclear power is a relatively clean power source, emitting far lower amounts of regulated air pollutants—and almost no greenhouse gasses—when compared to coal and natural gas.[10]

Despite these virtues, Texas will need new baseload and peak power long before the next nuclear generator becomes operational. A number of factors ensure that substantial numbers of new nuclear power plants—or additional units at established plants—are years, if not decades, in the future: 1) nuclear power plants are much more expensive to build than comparable coal or gas fired plants; 2) a great deal of fear has been generated among the public of having a nuclear power plant sited in the vicinity of any populated area; and 3) the federal government has failed to streamline the regulatory licensing process and to find a permanent storage facility for spent nuclear fuel or to begin recycling of that fuel.

Talking*Point*:

Only a few power sources match the requirements needed to provide baseload power: in Texas these are coal, nuclear and natural gas.

Talking*Point*:

Four of the five states with the lowest electricity prices use coal to generate more than 90 percent of their electricity.

NATURAL GAS: HIGH COSTS AND COMPETITION FOR CONSTRAINED SUPPLY LIMIT ITS ATTRACTION

Natural gas has many virtues as a source of electric power. Relative to coal power, it produces few pollutants and lower carbon dioxide emissions. In addition, for baseload power, natural gas-fired power plants are inexpensive to build relative to comparable coal or nuclear power plants, while being every bit as reliable. Combined-cycle gas plants also provide a source of heat as well as electricity for industrial uses. And natural gas has two types of flexibility that neither coal nor nuclear offer. Natural gas powered turbines come in a number of sizes, so they can provide on-sight distributed power generation—avoiding the need for a large transmission system in relatively isolated areas. This allows users to generate their own power—either to supplement or replace power from the grid—as desired, due to price considerations or supply constraints. Because the turbines can be turned on or off and get up to full capacity and generating efficiency within a relatively short time period, natural gas is ideal as a source for peak power generation.

With the deregulation of the natural gas pipeline system, the price for delivered natural gas fell substantially. Low fuel price, combined with the virtues previously listed, made natural gas an attractive choice for new generation throughout the economic boom of the 1990s. However, this boom in demand, as any first year economics student would point out, absent a corresponding increase in supply, led to sharply rising gas prices.

Natural gas prices are more than double what they were in 2001. Natural gas producers have responded to higher prices by increasing the number of drilling rigs from 1,400 in 2005 to more than 1,700 today. In addition, natural gas imports have increased and a major expansion of liquefied natural gas terminals (for natural gas imports), is in the works. This has increased proven reserves, but new demand has far outpaced new production and prices remain high. In addition, the cost of finding and delivering natural gas has more than tripled what it was in 2004 due to two facts: 1) many of the newly discovered reserves are more expensive to access and deliver, and 2) the pockets of gas are smaller, so the costs are higher relative to the amount of gas accessed.

Natural gas prices aren't just high, and unlikely to fall much in the future, they are also volatile—rising and falling sharply within very short periods of time. As evidence, one needs look no further than the sharp spike in prices in the months immediately following the supply disruptions caused in 2005 by Hurricanes Katrina and Rita.

The high cost and volatility of natural gas prices, combined with Texas' overreliance, is the reason why the price for electricity in Texas is higher than the national average. Texas' average electric rate in September was 12.5 cents per KW, compared to a national average of 10.94 cents per KW, about 14 percent above the national average. By way of comparison, four of the five states with the lowest electricity prices use coal to generate more than 90 percent of their electricity.[11] Neighboring states with similar or even warmer summers use more coal and have lower electric rates.

High natural gas prices that arose as the country increasingly shifted to natural gas for electricity have had a profound effect on the economy—far beyond their direct affect on the price of electricity. To understand why, one need only note that historically, natural gas has been used to cook, heat homes, and as a feedstock for and to process and refine industrial chemicals—including plastics, fertilizers, and pesticides. Thus, the average U.S. home paid 71 percent more to heat their home in 2004 than they had five years previously. Farmers in the U.S. paid $6 billion more for energy in 2003 and 2004 due in part to a more than doubling of the cost of fertilizers which are produced using natural gas. In the chemical industry, energy for fuel, heat, and feedstock accounts for up to 85 percent of total production costs. Thus, 240,000 jobs in energy-intensive industries have been lost in the chemical industry as its energy costs have increased by more than $10 billion since 2003. Seventy chemical facilities closed in the U.S. in 2004, and of the 120 plants being built —costing more than $1 billion—only one is being built in the U.S.[12]

Texans, both individual residents and businesses, have been especially hard hit by soaring gas prices. Why? On the business side, a disproportionate amount of the oil, gasoline, and chemical refining and production in the U.S. takes place along the Texas coast—a virtual chemical corridor from Texas City and Baytown through Houston to Lake Jackson and beyond. High natural gas prices are whipsawing an important source of high paying jobs and products for which we have net exports. On the residential side, the unfortunate fact is that Texas is a low income state—with median household incomes substantially below those in other higher-cost power states. Indeed, at 17.6 percent of the population, Texas' poverty rate is far above the U.S. average. High costs and high summer demand deliver a one-two punch for low income Texans. Families earning more than $50,000 per year spend just 4 percent of their income to cover all energy costs, and less than 2 percent on electricity. By comparison, even with fuel assistance and other energy assistance programs, households earning between $10,000 and $25,000 per year spend 13 percent of their income on energy overall and 4 percent on electricity alone. Families earning below $10,000 per year spend as much as 29 percent of their income on energy and more than 6.3 percent on electricity.[13]

Natural gas prices are unlikely to decline much in the future, if for no other reason than our supplies of natural gas are limited. On a BTU basis, natural gas makes up only 10 percent of the recoverable reserves of fuel in the U.S. Further complicating matters is the fact that much of the remaining natural gas supplies in the U.S. are on public lands and off-shore on the Outer-Continental Shelf—areas currently off-limit to exploration and production due to environmental regulations.

In short, natural gas can, and likely will, serve as fuel for baseload power. However, its high cost and increasingly limited availability reduces its attractiveness as a primary electric fuel source. And because natural gas has value outside of its use for electric power—as a feedstock for the chemical industry, as a fuel for heating and cooking, and flexibility for spot or peak demand that the other energy sources lack—Texas will benefit if it diversifies its mix away from natural gas as a dominant source of electric power to a mix of fuels in which coal plays a larger part.

COAL TO THE RESCUE

Only one fuel presently meets the United States' and Texas' increasing demand for energy independence, low cost, reliability, and the ability to meet increasing demand in the short-time frame needed: coal. As far as energy independence, the U.S. is literally the Saudi Arabia of coal—the U.S. has 27 percent of the world's coal reserves, enough domestic reserves to meet demand for more than 250 years.[14] Additionally, though they are more expensive to build than natural gas fired plants, coal plants are cheaper than nuclear plants and the low cost of coal as fuel makes it the logical choice if reducing the price consumers pay for electricity is a desirable goal. At less than 3.5 to 4 cents per KH, the price of coal-fired electricity on the spot market is lower than any other fuel source.[15] At less than $2 per million BTU's, as a source for electricity, coal is 1/4 the cost of natural gas with 1/20 of the price volatility.[16]

Indeed, recent research has estimated the economic benefit of coal-based energy and found that the annual benefit of coal use currently adds $1 trillion to U.S. GDP, providing more than $360 billion in household income and accounting for nearly seven million jobs.[17]

Talking*Point*:

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Talking*Point*:

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Few people dispute coal power's advantages as a low cost, reliable, abundant source of electricity. Rather, critics argue that coal is a dirty fuel that's continued use poses a substantial threat to public health and the environment. Further, they argue that the future demand—which would otherwise be met by coal—can be met through a combination of policies which would reduce demand while providing a cleaner, alternative source of power.

COAL: WHAT ABOUT CLEAN AIR AND PUBLIC HEALTH?

The most serious claim by coal critics is that new coal-fired power plants will necessarily increase air pollution in Texas, making already dirty air even unhealthier. They argue that increasing coal-fired electric generation will bring a host of health problems including, increased incidences of asthma (especially among children) and more hospitalizations and death due to respiratory and pulmonary distress. If true, these would be serious affects that should cause the public, the electric power industry, and policymakers alike to question whether Texas can afford the costs of new coal-fired power plants. Fortunately, building new coal-fired power plants does not mean dirtier air and increased health risks. Air quality in Texas is already at levels shown to be safe and will continue to improve in the future even with new coal-fired power plants—Texas can have affordable, reliable energy and cleaner air!

Nationwide, even as energy use—including coal use—has increased, levels of all ambient air pollutants regulated by the Environmental Protection Agency (EPA) have declined substantially. Indeed, from 1980 to 2005, while coal usage increased 61 percent and driving nearly doubled:

- Fine particulate matter (PM2.5) declined 40 percent.
- Peak 8-hour ozone (O3) levels declined 20 percent, and days per year exceeding the 8-hour ozone standard fell 79 percent.
- Nitrogen dioxide (NO2) levels decreased 37 percent, sulfur dioxide (SO2) dropped 63 percent, and carbon monoxide (CO) concentrations were reduced by 74 percent.
- Lead dropped 96 percent.[18]

Furthermore, the pace of technological improvement and change, combined with existing and increasingly stringent federal air pollution requirements, ensure that air pollution will substantially decrease in the next two decades—even as energy use in general and coal generated electricity in particular continue to increase.

A recent study by Joel Schwartz from the Texas Public Policy Foundation shows that the air quality trends in Texas are similar to the national trends. While coal power has increased marginally since 1995, Texas' air quality has improved with SO2 levels dropping 27 percent since 1999 and NOx levels dropping more than 60 percent since 1998.[19]

Texas already complies with most federal air pollution standards, usually with plenty of room to spare. All of Texas meets federal standards for carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), and lead. Even though coal-burning is the main source of SO2 emissions, from 1996 to 2006 the highest SO2 levels in Texas didn't come within even half the level of EPA's 24-hour SO2 standard or within one-third the level of the annual standard. The DFW metropolitan area's SO2 levels are even lower.[20]

Power plants do not appreciably contribute to carbon monoxide or volatile organic compound emissions, and the story is similar for NO2, a component of NOx. According to EPA's 2002 National Emissions Inventory, NOx from power plants accounted for about 7 percent of the total in the DFW area and about 13 percent statewide (the Texas Commission on Environmental Quality estimated that the NOx from power plants in 2007 accounted for about 3 percent of the total in the DFW area).[21]

Nevertheless, the highest NO2 levels in Texas don't come within even half the federal standard. Levels of particulate matter and smog have also declined across Texas over the past six years, though the declines have been more marked from their peak levels and in the major regions of concern, DFW and in Houston, than from their average levels statewide.

How has the nation's air quality improved despite the increasing use of coal to generate electricity? The short answer is older coal-fired power plants emitted 90 percent more pollution than new state-of-the-art plants like those being proposed for Texas.[22] As older plants were replaced with newer coal-fired plants—or as they were upgraded and forced by clean air regulators to install new pollution controls—overall pollution decreased even as energy production increased. As a result, overall emissions of SO2 from coal-fired power plants are four times lower now than in 1970 and NOx emissions are three times lower overall. Under current clean air rules slated to take effect in 2010, emissions will be more than halved once again.

As a result, neither current nor anticipated levels of air pollution pose any significant risk of harm to Texas residents—even in those cities with stubborn ozone pollution problems. This despite most of what Americans "know" about air pollution. For instance, while polls show most Americans believe air pollution has been steady or rising during the last few decades, the EPA data offered above shows air pollution has declined substantially. And while the same polls show that most people believe that air pollution poses a serious threat to people's health, the reality is that current levels of air pollution are well below those shown to have serious health effects.

Asthma and neurological disorders (from mercury in fish) are among the most prominent health hazards linked to air pollution from power plants. However, scientifically, the case just can't be made. The aforementioned Schwartz paper clearly shows that neither asthma nor mercury poisoning can be linked to coal-fired generation of electricity.[23]

Texas will continue to see improvements in air quality, regardless of whether growing demand for electricity is met with coal or with other fuels. The question is what cost must Texans pay for their electricity? Put this way, there should really be no choice to contemplate since coal plants with state-of-the-art pollution controls are likely to provide cheaper electricity than alternative energy sources promoted by opponents of new coal plants.

ELECTRICITY WITHOUT COMBUSTION: WHAT ABOUT WIND POWER?

The virtues touted for wind power are basically twofold: 1) the power source is as free as the wind, and 2) in operation wind turbines produce no pollutants or greenhouse gases.

Despite these virtues, wind power is hardly "green," if by green one means an energy source producing no environmental harms. Concerning pollution, because wind is an intermittent resource, wind farms must rely on conventional power plants to back up their supply. Bringing a conventional power plant online to supply power is not as simple as turning on a switch. Thus, most of the fossil fuel power stations required to supplement wind turbines are not "redundant," but must run continuously, even if at reduced levels. Not running at peak efficiency, these "backup" power plants, while producing less total pollution, are putting out more pollution per unit of energy produced. When combined with the CO2 emitted and pollutants released in the manufacture, transportation, and maintenance of wind towers and their associated infrastructure, substituting wind power for fossil fuels does little to reduce air pollution.[24]

Wind power has other environmental costs: they are unsightly, reduce the property values of adjoining lands, take up thousands of acres of wildlands and habitat, kill tens of thousands of

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Talking*Point*:

Wind power fails to deliver when it is needed the most, during peak summer operations.

birds and bats each year, and increase the wind-blown dust in the areas where they operate. Additionally, wind farms produce only a fraction of the energy of a conventional power plant but require 100 times the acreage. For instance:[25]

- Two of the biggest wind "farms" in Europe have 159 turbines and cover thousands of acres; but together they take a year to produce less than four days' output from a single 2,000 MW (megawatts) conventional power station—which uses 1 percent as much space.
- A proposed wind farm off the Massachusetts coast would produce only 450 MW of power but require 130 towers and more than 24 square miles of ocean.
- A comparison of "footprints" is telling: to produce 1,000 MW of power, a wind farm would require approximately 192,000 acres, or 300 square miles; a nuclear plant needs less than 1,700 acres, or 2.65 square miles (within its security perimeter fence); and a coal-powered plant takes up about 1,950 acres, or 3.05 square miles.[26]

As a result of the growing awareness of wind power's environmental drawbacks, the U.S. National Academy of Science's National Research Council issued a report which recommended slowing the growth of wind power until proper guidelines can be developed and adopted to properly account for a reduction in the negative environmental impacts from increased reliance on wind turbines.[27]

For the purposes of this report, the main reason wind power cannot make a significant contribution to Texas' future power needs is its unreliability and high costs. Wind power cannot serve as either a baseload or peaking power source because it is unreliable—quite simply, when the wind doesn't blow or when it blows too fast, turbines don't produce energy, and when it does blow, the energy delivered to the grid fluctuates with the breeze. While nationally, wind-power marketers and promoters argue that wind turbines are reaching 33 percent efficiency—meaning on average they can be counted on to produce about 1/3 of their rated power, or power 30 percent of the time—in reality the production figures are even lower. All the wind turbines in Texas produce power equal to a single mid-sized, coal-powered boiler.

At 2,768 MW, Texas leads the nation in the amount of installed wind power. Yet, this still amounts to only 1 percent of the state's energy supply on average. An even greater challenge is that wind power fails to deliver when it is needed the most, during peak summer operations. ERCOT has recently reported that during periods of peak summer demand, it can only count on 2.6 percent of wind power's capacity being available at any particular time, with a range of availability from 0 to 49 percent of installed capacity.[28]

Wind's limited reliability comes at a high cost. The price of wind-generated electricity has fallen more steeply than any other source over the last 30 years. Indeed, the cost of wind power fell from approximately 25 cents per kilowatt hour (kWh) in the early 1980s to between 5 cents and 7 cents (adjusting for inflation) in prime wind farm areas a decade later.[29] At this price, wind power is competitive with coal power. However, this price is misleading since the federal government allows accelerated depreciation of wind power projects and provides a direct production tax credit of 1.8 cents per KH. In sum, absent these subsidies and state mandates requiring renewable fuels, wind power would not be growing in Texas (or probably in the rest of the nation) and the state certainly cannot count on wind farms to satisfy more than a small portion of Texas' future power supplies.

WHAT ABOUT CONSERVATION AND DEMAND REDUCTION?

In recent months environmental organizations have offered a series of reports arguing that all, or nearly all, of Texas' future energy growth can be met through demand-side management including, more stringent state-mandated energy efficiency standards for new appliances, automated control of thermostats, updating residential and commercial building codes to improve the energy efficiency (better insulation and more efficient windows), and requirements that utilities invest in efficiency resources.[30] They argue that not only can these and other “efficiency” measures meet Texas' estimated load growth through 2023 (depending on the study), they can do so while saving Texans' money. One of the studies estimates a total economic benefit of meeting Texas' future electricity demand by reducing demand and implementing efficiency measures at $38 billion over 14 years.[31] According to the study, an investment of $11 billion in efficiency measures, would return $4.40 to the Texas economy for every dollar invested.

If these analyses were sound, the recommendations made in these reports might be worth adopting. However, there are a number of reasons for thinking that the true result of these measures would range from higher prices for energy and household appliances to a long-term power deficit leading to recurring, periodic outages.

Even if construction of new coal-fired power plants were started today, it will be 2009 at the earliest, and more likely 2010, before they would deliver any electric power to the grid. Texas’ supply of electricity may well fall below the reserve margin of 12.5 percent this year. The reserve margin is the amount thought needed to ensure that adequate electricity will be available in the event of extreme weather events or the loss of major generating units.

Accordingly, some amount of energy “supply” will likely have to be provided through demand-side management. The most likely candidate for this looming shortfall is signing more industries, government entities, and businesses up for interruptible supply. Under this system, in a time of crisis or electric power shortfall, the entities involved allow their power to be shut-off for periods of time necessary until the crisis passes. Companies that agree to interruptible supply contracts usually receive discounted energy prices in exchange. Currently, ERCOT counts 1,100 MH of interruptible supply in forecast peak demand. This amount is less than the amount of interruptible loads —3,200 MH —that ERCOT counted before 2000. It would be wise if the amount of interruptible load was substantially and permanently increased.

Undoubtedly, as new technologies are developed, they will be more efficient—using less energy for the desired result. But it’s not clear that efficiency gains will result in less energy used. Historically, as products and processes become more efficient, the relative energy cost of using it decreases, and as energy prices go down, individuals and companies use more of it ultimately increasing demand. Static analyses do not account for this fact. In addition, the analyses claiming that future energy needs can be met with conservation and demand management only address the estimated energy demand before any older plants are shut down. In other words, even if all new demand could be met with efficiency measures, new power supplies would have to be brought online to replace the electricity produced by power plants that have reached the end of their useful life.

Cost to the general public is the main factor that makes it unlikely that demand -ide measures can satisfy more than a small portion of Texas’ future electric demand. The costs involved are both direct and indirect. The indirect costs come in three forms. While the Texas Legislature could, in theory, enact stricter building requirements (mandates for more fuel efficient buildings) for businesses and residences, such requirements add thousands to tens of thousands of dollars to the price of a new home. These costs will undoubtedly price many new home buyers out of the market. Even if, overtime, the energy savings reaped by the homeowners exceed the additional upfront costs of building a new home, the higher initial down payment and the bigger mortgage could,

Talking*Point*:

The true result of forced conservation measures would range from higher prices for energy and household appliances to a long-term power deficit.

Talking*Point*:

States using demand-side and efficiency measures to meet energy needs have higher per KH energy costs than Texas.

at the very least, delay the American dream of individual home ownership for many buyers. Perversely, the law of unintended consequences could come into play. Because new homes, even without new state mandates, are in general much more energy efficient than older homes, the higher price tag for new energy efficient homes could keep current homeowners in less energy friendly homes longer.

What is true of homes is also true of proposals to mandate state level energy efficiency requirements for home appliances. Stricter energy use requirements for new appliances would impose two kinds of cost. First, the new appliances would be more expensive. Unless substantial energy cost savings are captured fairly quickly, property owners would likely delay purchasing new appliances as long as possible, and a thriving market in used appliances would likely arise, with homeowners/property owners repairing current appliances when they are broken rather than replacing them with new appliances. This result may be good for repair shops, but it would be bad news for retailers and manufacturers.

In addition, any attempt by the Legislature or lesser political subdivisions would likely wind up in court with appliance manufactures suing the state to void the law, arguing that it violates interstate commerce. There is no question that this would involve interstate commerce questions. It would be more costly for manufactures to have to meet separate standards for Texas (or state by state should other states take this path), than it is to meet the currently existing federal standards. Accordingly, since the federal government already sets energy efficiency standards, any state wishing to set more stringent standards would likely have to get a waiver from the federal government to do so. Absent such a waiver, the courts would likely be sympathetic to the manufacturers' claims. Fighting this lawsuit will impose substantial costs on the taxpayer in what is likely to be a losing cause.

If the Legislature decides to enact new energy efficiency requirements on new homes and appliances anyway, the extended time frame needed to allow homebuilders and manufacturers to develop, purchase, or adopt new technologies means that any energy savings from these programs are years off and will come far too late to avert Texas' looming energy shortfall.

A more direct understanding of the true costs of attempting to meet Texas' future electricity demand—via demand-side reduction and efficiency alone—comes from the states cited as examples that we should follow. In particular, California, Massachusetts, Connecticut, and Vermont are held out as states that have and are attempting to eliminate all demand growth through efficiency gains. There are a number of important facts that are ignored in this discussion. First, these states have much milder summer climates than Texas—many of their residents don't have, or need, air conditioning—meaning they are much less reliant on electric power. Second, at 12.7 percent since 2000, Texas' population growth has been double the national average (6.4 percent). By contrast, of the four States cited as examples of a desirable energy policy, only California at 7.6 percent is experiencing population growth above the nation as a whole. Indeed, each of the three remaining states have growth rates less than half (and one less than 1/4) the national average.[32] And, whereas the industrial base in the three northeastern states cited is shrinking—they are losing manufacturing jobs—Texas has a large, vibrant, and growing industrial base.

Some analysts have argued that one of the reasons for California's recent well-publicized series of energy shortfalls and blackouts is due, in part, to its heavy reliance on demand-side efforts to reduce the need for new energy, rather than trying to increase supplies in the face of a growing population. Whether that is true, what is unquestionably the case is that despite milder climates, slower population growth, a declining industrial base—all resulting in a much lower demand for electric power—California, Connecticut, Massachusetts, and Vermont each have higher per KH energy costs than Texas.[33]

WHAT ABOUT GLOBAL WARMING?

Among the leading reasons environmentalists object to the construction of new coal-fired power plants (and argue for shuttering existing ones) is that they are prime contributors to potentially catastrophic global warming. As an alternative, they argue that no new coal-fired power plant should be built unless it is an Integrated Gasification Combined-Cycle (IGCC) plant with carbon capture and storage technology. Neither option is likely or desirable.

The earth has warmed a modest amount (about 1 degree Fahrenheit) over the past 150 years. But the extent to which humans are responsible for this rise and whether continued warming will cause serious environmental harms are issues actively being debated in the scientific community. What is clear is that the amount of greenhouse gases has risen, mostly since 1950, and the electric utility sector contributes about 25 to 40 percent of the human-emitted greenhouse gases in the atmosphere. Coal emits far more CO2 per unit of energy produced than any other electric power source.

All this being true, if human energy use is the prime culprit behind the present warming trend, there is no policy proposal on the table to reduce greenhouse gas emissions by an amount necessary to significantly reduce further warming—and all of the proposals put forward thus far would have substantial costs that far outweigh their benefits.

Concerning the former point, the Kyoto Protocol requires industrialized countries to reduce greenhouse gas emissions by an average of 5 percent below 1990 levels overall, in an effort to avert human-induced global warming. More specifically, between 2008 and 2012 the U.S. would be required to reduce its greenhouse gas emissions by about 40 percent—to 7 percent below their 1990 levels. Despite these substantial reductions, according to the National Center for Atmospheric Research, even if all of the Kyoto signatories met their targets, the earth would be only 0.07 to 0.19 degrees Celsius cooler than it would be absent Kyoto. Greenhouse gas concentrations will continue to increase, as fast growing countries exempt from emissions cuts—such as China, India, South Korea, Brazil, and Indonesia—will account for as much as 85 percent of the projected emissions increase in the next two decades. Indeed, China, which is averaging one new coal-fired power plant a week, is expected to surpass the U.S. as the largest greenhouse gas emitter by the end of 2007.

The Congressional Budget Office (CBO) calculated that the Kyoto protocol would have cost the economy over $300 billion annually. Indeed, every peer review of the economic costs of the Kyoto treaty have shown that its benefits would far exceed its costs.[34] As a result, the Bush administration wisely decided not to submit Kyoto to the Senate for ratification or to attempt to implement it through legislation or regulations.

The high cost and negligible environmental benefits delivered by Kyoto have not dissuaded environmentalists—or their allies in Congress and the states—from proposing domestic legislation to reduce greenhouse gas emissions. These less stringent domestic alternatives to Kyoto will be no more effective at preventing future warming, but, like Kyoto, just limiting the discussion to electricity, these proposals do come at a high price.

For instance:

- A 2003 bill co-sponsored by Senators John McCain and Joseph Lieberman called the *Climate Stewardship Act* (S. 139) would have required greenhouse gas emissions to be reduced to 1990 levels by 2016. A June 2003 analysis by the U.S. Energy Information Agency of the probable economic effects of the bill found that, by 2025, the average household would spend $444

Talking*Point*:

If all of the Kyoto signatures meet their targets, the earth would be only 0.07 to 0.19 degrees cooler—at a cost to the U.S. economy of $300 billion annually.

more per year on energy, including a 46 percent increase in electricity prices; gross domestic product would be $675 billion to $1.63 trillion lower, in present dollars.

- An analysis by the American Council for Capital Formation estimated that, under S. 139, electricity prices would increase 43 percent, and average household income would fall by as much as $2,255 per year by 2020.[35]

Talking*Point*:

A cap-and-trade system would result in massive $300 billion wealth redistribution from the poor and working class to wealthier Americans.

In the past two months, MIT and the CBO have both analyzed more recent federal proposals to reduce greenhouse gas emissions through what many consider to be the least costly way of reducing emissions: cap-and-trade. Under cap-and-trade, the government sets a cap on total emissions and gives, or auctions, allowances to emit carbon dioxide to energy producers, permitting them to trade these allowances among themselves. In theory, this allows producers to figure out the least costly way of cutting emissions and then trade their excess allowances to those companies unable to find low-cost solutions. The results of these analyses should be sobering for those who think we can prevent global warming at little or no cost.

The MIT study concludes that a proposal by Senators Bernie Sanders (I-VT) and Barbara Boxer (D-CA) is tantamount to imposing a tax of $366 billion annually, or more than $4,500 per family of four, by 2015. And the annual costs will grow after 2015.[36]

The CBO study details how a cap-and-trade system would result in massive $300 billion wealth redistribution from the poor and working class to wealthier Americans.[37] As noted above, proposals that raise energy prices are highly regressive, as the poor spend a disproportionate share of their income on energy or items upon which energy makes up a significant share of their costs.

A pair of studies has looked specifically at the effects of climate change legislation on the use of coal to generate electricity and the broader effects on the economy and public health. Researchers at Pennsylvania State University estimated the economic benefits of coal and the potential impact of replacing coal with more expensive energy sources such as natural gas and a 10-percent mix of renewables. They netted out the positive offsetting impacts of investments in replacement fuels and electric generating capacity.[38] By 2015:

- A 33 percent reduction in coal-fired electric power generation would reduce GDP by $166 billion, household income by $64 billion, and employment by 1.2 million below what it otherwise would be.

- A 66 percent reduction in coal-fired electric power generation would reduce GDP by $371 billion, household income by $142 billion, and employment by 2.7 million.

The impact of eliminating coal wouldn't be limited to the economy; indirectly, it would also negatively affect health. Harvey Brenner of Johns Hopkins University conducted the first major research on the impacts of unemployment on public health for the Joint Economic Committee of Congress in 1979 and 1984. Brenner found that a 1-percent increase in the unemployment rate was associated with a 2-percent increase in age-adjusted mortality. In other words, every 1-percent increase in unemployment resulted in a 2-percent increase in premature deaths.

In 2004, Brenner used his model to estimate the impacts from proposed global warming legislation on coal use and the implications for public health.[39] Brenner's analysis shows that the upward trend in real per capita income is the most important factor explaining decreased U.S. mortality rates since the 1960s. Conversely, any reduction in GDP per capita increases the mortality rate.

Brenner applied his model to the findings of two studies that estimated the adverse economic impacts of reduced coal use—a 2001 Penn State study and an analysis of the impacts of the Kyoto Protocol by DRI, a noted economic forecasting and consulting organization. Brenner adjusted the results of these studies to approximate the income and unemployment effects of a hypothetical complete elimination of coal.

Brenner reports that "the estimated additional mortality in the year 2010, based on four different variations of the model, ranges from an additional 170,507 to 368,915 deaths for the displacement of 100% of coal-based generation. The author's moderately conservative estimate is based on an annual change model at 195,308 deaths."

According to Brenner, his analysis could be applied to specific climate change policies affecting coal-fired generation:

> Given an estimated potential displacement of 78% of U.S. coal generation based on EIA's study of proposed climate change initiatives, the indicated premature mortality from reduced income and increased unemployment would exceed 150,000 deaths annually, absent direct and effective mitigation programs.

Brenner's finding of 150,000 or more premature deaths potentially resulting from national climate change legislation is many times greater than EPA's estimates of the benefit in reduced premature mortality from new national ambient air quality standards. EPA estimates that implementation of the new 8-hour ozone standard would reduce premature mortality by 1,000 to 3,000 lives annually, while the new PM2.5 standard for fine particulates would reduce premature mortality by 15,000 lives annually.

Some analysts who fear the effects that increased coal use will have upon the climate nevertheless recognize that coal's relative abundance and cheapness, combined with the need for substantial supplies of new energy in the near- to mid-term, make it inevitable that new coal-fired power plants will be brought online. Therefore, as a back-up position, rather than calling for banning new coal generation entirely, they demand that all new coal-fired power plants that are built use IGCC technology.

IGCC turns coal into gas before it is burned. IGCC plants offer only modest reductions in air pollutants, when compared to current state-of-the-art pulverized plants burning low sulfur coal. While both types of plants will reduce nitrogen oxide emissions—83 percent below the levels emitted by previous generations of coal-fired power plants—IGCC plants reduce sulfur dioxide emissions by 93 percent, compared to 90 percent in new pulverized plants. Where IGCC really shines is that, by gasifying coal, it is much easier to remove and store CO2.

This benefit, however, comes at unacceptable costs: higher prices and unreliability. IGCC plants cost, on average, $200 million more per plant than conventional pulverized coal power plants. If the high costs were not already enough to dissuade utilities from heavily investing in IGCC plants, and lawmakers from mandating them, the unreliability of the technology puts the nail in their coffin for the short-term. IGCC is still largely an experimental technology with few "working models" around the world. While there are no commercially viable IGCC plants in the United States, there are two IGCC plants "operating" in Florida and Indiana.[40] They are both heavily subsidized by the federal government, set up by the Department of Energy as demonstration projects. Technical troubles have hampered their operation, with the result that they can only operate approximately 30 percent of the time.

Even if IGCC plants eventually move from the experimental to the mainstream, pulverized coal plants will still be the only viable option for Texas. Why? IGCC plants do not work well

Talking*Point*:

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with the cleaner burning Western coal used in Texas. Logistically, it's difficult to burn Eastern coal, since every power plant burns 140 train cars of coal a day, requiring 1,400 cars to make the trip from Ohio and West Virginia to Texas every 24 hours to meet planned expansion.

Despite the fact that current proposals to prevent global warming are unlikely to be effective but will undoubtedly be costly, there is a strong possibility that, at some time in the future, the U.S. will adopt legislation to constrain CO2 emissions from energy use. Such legislation is not likely to pass during the present administration, nor is the EPA likely to issue rules cutting carbon emissions—as they have explicitly been allowed to do, per a recent United States Supreme Court ruling—before the Bush administration leaves office. Even under a new administration, the EPA may wait until Congress takes the first step before treating CO2 as a pollutant. What form climate change legislation might take is anybody's guess, but what is clear is that neither Texas nor the nation can wait until Congress acts before moving forward with plans to increase electricity production.

Fortunately, if the past is any guide, coal plants—either newly brought online or those under construction when the law is passed—are not likely to be directly affected by whatever legislation passes. Previous clean air laws have routinely grandfathered in older power plants, only demanding new technologies on new plants or when older plants are upgraded. Some federal legislators have threatened that this would not be the case under proposed climate legislation, but they may not have the final word, since powerful senior Senators from coal-producing states would have to sign-off on any climate change legislation affecting the industries fortunes before any bill could get a vote. Even if stringent climate change legislation passes, utilities with coal-fired power plants should be able to meet their carbon emission reductions, through a number of mechanisms, none of which need affect the operations or foreclose the possibility of building new coal-fired power plants. For instance, they could get credit for reducing emissions:

- via the retirement of older plants that were slated to be shuttered soon anyway;
- by buying carbon credits on the open market;
- by mitigating their emissions through developing and purchasing so-called green power;
- by investing in clean carbon technologies in developing countries; or
- by removing carbon from the atmosphere, for example, by planting trees or fertilizing dead spots in the ocean or capturing carbon and storing under the ground and in the oceans.

Any of these responses would have costs, and some would be more costly than others, but the fact that these options are available show that, even in a carbon-constrained world, coal power has a place.

CONCLUSION

Without new capacity, Texas may soon experience either periodic blackouts or increased energy prices—or both. Only coal can deliver the amount of reliable, inexpensive power Texas residents and companies desire. While coal-fired power plants have environmental impacts—as do all other forms of electricity production—these impacts are not a threat to human health or the environment. Policymakers should consider the facts when considering the development of new coal-fired power plants. If the Texas economy is to continue to grow and its residents prosper, Texas' abundant supply of coal will have to play an increasingly important role in Texas' electricity production. ☆

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About the Author

H. Sterling Burnett, Ph.D. is a Senior Fellow for the National Center for Policy Analysis (NCPA) and the Texas Public Policy Foundation. While Burnett works on a number of issues, he specializes in issues involving environmental policy and gun policy.

His articles and opinion pieces have been published in *Ethics, Environmental Ethics, International Studies in Philosophy, The World and I, USA Today, Los Angeles Daily News, The Washington Times, The Dallas Morning News, Rocky Mountain News, Miami Herald, Las Vegas Review-Journal, Detroit News, The Seattle Times* and *Human Events.*

Burnett received his P.h.D. in 2001 from Bowling Green State University; Doctoral dissertation entitled "Ecosystemic Goods: The Pros and Cons of a Property Rights Approach."

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