Texas Advisory Panel
On
Federal Environmental Regulations

POTENTIAL IMPACTS TO TEXAS OF THE ENVIRONMENTAL PROTECTION AGENCY'S PROPOSED FRAMEWORK FOR REGULATING GREENHOUSE GAS EMISSIONS

November 25, 2008

Texas Advisory Panel on Federal Environmental Regulations

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The Honorable Rick Perry
Governor of Texas
State Capitol
P.O. Box 12428
Austin, Texas 78711

Dear Governor Perry:

In November 2008, you created and charged the Texas Advisory Panel on Federal Environmental Regulations with assessing the potential impacts to Texas of the Environmental Protection Agency's (EPA) proposed framework for regulating greenhouse gas emissions through the Federal Clean Air Act (FCAA).

Regulating greenhouse gases under existing EPA regulatory authority would cause Texas to suffer from extreme economic hardships, regulatory uncertainty, and immeasurable standards. The proposed framework would have adverse economic impacts on Texas industry, agriculture, energy production, and potentially would subject small businesses, office buildings, schools, hospitals, farms, and multi-family and large-family residences to FCAA regulations.

On behalf of vice-chairmen, Barry T. Smitherman and Michael Williams, I submit to you a document for your consideration: "Potential Impacts to Texas of the Environmental Protection Agency's Proposed Framework for Regulating Greenhouse Gas Emissions."

Respectfully,

Bryan W. Shaw

Bryan W. Shaw, Ph.D.
Chairman

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Acronyms

ACCF	American Council for Capital Formation
ANPR	Advance Notice of Proposed Rulemaking
ASHRAE	American Society of Heating, Refrigerating & Air Conditioning Engineers
Bbl	barrel
Btu	British thermal units
CCS	carbon capture and sequestration
CO_2	carbon dioxide
CREZ	Competitive Renewable Energy Zones
DOE	U.S. Department of Energy
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
ERCOT	Electric Reliability Council of Texas
FCAA	Federal Clean Air Act
GDP	gross domestic product
GHG	greenhouse gases
GSP	gross state product
GWP	global warming potential
HAP	hazardous air pollutant
HFC	hydrofluorocarbons
IESNA	Illuminating Engineering Society of North America
ITP	Industrial Technologies Program
LAER	lowest achievable emission rate
LNG	liquefied natural gas
MACT	maximum achievable control technology
MECS	Manufacturing Energy Consumption Survey
MMbbl	million barrels
MW	megawatts
NAAQS	National Ambient Air Quality Standards
NAM	National Association of Manufacturers
NSPS	New Source Performance Standards
PFC	perfluorocarbons
PSD	prevention of significant deterioration
PUC	Public Utility Commission
R&D	research and development
RPS	renewable portfolio standards
SECO	State Energy Conservation Office
SIP	state implementation plan
TCEQ	Texas Commission on Environmental Quality
Tcf	trillion cubic feet
U.S.	United States

Executive Summary

Using any existing Environmental Protection Agency regulatory authority under the Federal Clean Air Act (FCAA) to regulate greenhouse gases (GHG) would create extreme economic hardships, regulatory uncertainty, and immeasurable standards. The primary GHG in most climate change proposals is CO_2, which is not a regulated air pollutant under current EPA standards. Given that CO_2 exists uniformly around the world, any local or regional reduction in CO_2 emissions will have no measurable impact on local levels in the atmosphere or on local weather conditions. Depending on the FCAA regulatory method used, attempts to reduce CO_2 emissions in Texas and around the nation would have tremendous impacts.

Regulatory costs associated with GHG regulation under the FCAA will have devastating impacts at both the state and national level. Accurate estimates are not possible given the lack of specificity in the ANPR. However, costs to the Texas Commission on Environmental Quality (TCEQ) could run from $40 to $80 million dollars annually, depending on which part of the FCAA is used to regulate GHG and how the programs are eventually implemented.

The requirement for PSD and Title V permits nationwide would increase ten fold. The drastic increase in the number of permits required will stem from both additional permits being required of currently permitted sources and permits from emission sources, including non-industrial sources, that would not otherwise require a FCAA permit. Using the FCAA as the regulatory vehicle to regulate GHG will subject small businesses, office buildings, schools, hospitals, farms, multi-family residences and even large single-family residences to permitting requirements and other FCAA requirements. Unless funding of the state regulatory agency is drastically increased, regulating GHG under the FCAA will divert resources away from the programs that the FCAA was intended to regulate, such as ozone.

A large portion of man-made CO_2 in Texas is created by electric generation. Traditional coal fired electric production emits more CO_2 than all other forms of electric generation. Reductions in CO_2 will likely be achieved by reducing coal-produced electricity, resulting in less fuel diversity, higher reliance on natural gas, decreased electric reliability, and higher prices for consumers. With energy demand in Texas expected to increase 31% by 2025, eliminating coal (the second largest source of power) will certainly be devastating to the state economy.

Coal mining and coal-fueled electric generation account for over 33,000 direct jobs and nearly $10.5 billion annually in total expenditures. The coal industry in this state also provides over $300 million in annual state and local revenues, with over half of that money going to county services and school district operations. State and local taxing authorities will likely need to generate these lost revenues from other sources.

State agriculture would be heavily impacted by CO_2 regulation, with a minimum of 3,800 farms, 28,000 beef cattle and 640 dairy operations affected. Increased production costs would result in increased food prices for consumers.

Texas continues to develop innovative ways to maintain a stable economy while protecting human health and the environment. Unmatched success at reducing emissions, a focus on energy efficiency, and incentives for new technology have allowed for continued growth while reducing CO_2 emissions with greater success than Europe.

Problems Regulating Greenhouse Gases (GHG) Through the Federal Clean Air Act (FCAA)

If the decision is made to proceed with GHG regulation, the FCAA is not an appropriate vehicle. For the most part, the FCAA assumes that State and local governments are able through regulations and permit requirements to implement emission controls that will improve air quality. GHG are distributed relatively uniformly throughout the world and state and local emission controls would have little or no impact on global concentrations. The FCAA presents, through multiple sections of the law, different regulatory mechanisms for control and reduction of air pollutants, however, none are suited for control of substances which, like GHG, are uniformly distributed throughout the world. The result would be the imposition of burdensome regulations with little or no chance of success without similar controls implemented worldwide. Since GHG, particularly CO_2, are ubiquitous, new regulations would affect many segments of society, some of which have not previously been regulated under the FCAA, and would have a negative effect on the economy. Entities that will likely be affected include small businesses, office buildings, schools, hospitals, farms, and multi-family residences. Some of the regulations may even impact large single-family residences. According to EPA, CO_2 emissions from the transportation sector are the largest source of emissions from end use sectors in the U.S. economy. States are generally preempted from regulating mobile sources.[1]

National Ambient Air Quality Standards (NAAQS)

A major problem with regulating CO_2 as a NAAQS is that the Environmental Protection Agency (EPA) would be required to establish standards that EPA considers appropriate. Setting a standard for a substance that presents no health risk was not anticipated by the FCAA. CO_2 emissions are strongly related to economic activity and, therefore, reducing CO_2 emissions to any great extent would have a strong negative impact on the nation's economy. EPA by statute is not allowed to consider economic impacts when setting the NAAQS. Further, an increased ambient CO_2 concentration has recognized benefits, such as increased vegetation growth rates, that EPA is unlikely to consider when determining an "appropriate" standard.

Once a standard is set, states must then develop plans (State Implementation Plans or SIPs) to attain those standards. The entire nation would be either above the standard (in nonattainment) or below the standard (in attainment) because CO_2 and other GHG are distributed relatively uniformly throughout the world. In either case, considerable state and local resources must be expended to implement the many NAAQS requirements. Because State and local emission controls would have little or no impact on worldwide CO_2 concentrations, these NAAQS requirements would be implemented with no chance of success. Regardless of the arbitrary standard established by EPA, there will be no way to measure local or regional improvement because of the uniform distribution of GHG. Because CO_2 is ubiquitous, NAAQS requirements would affect many segments of

[1] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006 (April 2008) USEPA #430-R-08-005

society, some of which have not previously been regulated under the FCAA, and would have a negative impact effect on the economy.

The mere imposition of a standard would require states to set up a monitoring network and develop an emissions inventory to track CO_2 emissions. Besides traditional industrial entities that must report their emissions to the State, major CO_2 sources under a NAAQS program would likely include office buildings, hospitals, schools, farms, multi-family housing, and even large single-family homes. The TCEQ estimates that 22 full-time employees at an annual salary cost of approximately $1.1 million will be required to implement and maintain the emissions inventory requirements alone.

The states would need to develop a SIP to demonstrate how they would attain the standard if EPA sets a standard below current worldwide ambient CO_2 concentration. Even if EPA sets a standard above current worldwide ambient CO_2 concentration the states must develop a "transport" SIP to demonstrate that they are not impacting other states' ability to attain the standard. They would have to develop "reasonable further progress" SIPs to demonstrate that they are making steady and measurable progress in reducing CO_2 emissions.

EPA has recently interpreted the FCAA to require sophisticated computer modeling of all areas out of attainment with NAAQS. Were this interpretation extended to CO_2 nonattainment areas, states would be required to model CO_2 sources in a pointless exercise to demonstrate compliance with the CO_2 standard. Besides a statewide inventory of anthropogenic CO_2 sources, the state would need to develop estimates of natural CO_2 sources and sinks (vegetation uptake, absorption into water bodies, etc.). Further, because of the disproportionate amount of natural sources relative to manmade sources, the state is unlikely to be able to provide a plan to EPA that would demonstrate attainment, thereby risking federal sanctions including the loss of federal highway funds.

If EPA designated the state as a Nonattainment area, an enhanced federal nonattainment permitting program would be required. In most or all areas, a state or local agency implements this program. Major CO_2 sources, which again could include office buildings, hospitals, schools, farms, multi-family housing, and large single-family homes, would be required to obtain federal permits before starting construction or modification of CO_2 sources. Under this scenario, in Texas one could reasonably expect a contested case permit hearing when proposing to build a hospital. The permits would require implementation of controls that meet the "lowest achievable emission rate" (LAER) which by statute is the lowest achievable rate without consideration given to whether the controls are economically viable. The state would be required to determine LAER for each source that requires a permit, which would include many source types previously unregulated by the FCAA. The permits would also require that the permittee obtain emission offsets before operating their facility. For example, if a new source is going to emit 50 tons of CO_2 per year they will have to provide for a greater reduction of CO_2 emissions (e.g., 60 tons per year) somewhere in the same airshed.

The economic consequences of requiring federal preconstruction/modification permits for CO_2 sources are substantial. Emission calculation protocols, control strategies, and permit conditions would all have to be developed because state, federal, and local regulatory agencies lack experience in permitting these types of sources. The additional burden of the federal permit program itself adds review time to permit processes. The likely result would be the delay of goods and services because timely construction projects would not be possible.

Another far-reaching NAAQS program is transportation conformity. State and local transportation planning organizations would need to develop transportation plans showing that federally funded transportation projects do not detract from an area's plan to attain the CO_2 standard. States would have to develop and stay within CO_2 transportation budgets. If a state cannot demonstrate attainment and EPA disapproves or does not receive a SIP, most federally funded road construction projects that increase capacity may not move forward, and the area's transportation plans cannot be revised.

Federal projects would be subject to general conformity. EPA has not developed an appropriate method for contemplating "background" conditions with respect to ozone whose ambient background concentrations are less than CO_2. Legal hurdles could be expected to delay federal projects as well.

The attainment demonstration SIP would include the states' assessment of reasonably achievable control measures for CO_2 sources. A wide variety of CO_2 sources, both new and existing, would then be required to comply with these control measures.

If the states don't comply with these many NAAQS requirements on the EPA's timeline, they face possible sanctions such as loss of federal transportation funding and even more stringent federal permitting requirements.

These are just a few examples of the many NAAQS requirements that the states would be required to implement. These programs would have little chance of success, but would require many state and local resources and have a negative effect both on the economy and on the resources available to achieve the environmental goals of existing FCAA programs. For the current NAAQS programs, Texas currently has 174 full-time employees and expends over $227 million.

An accurate estimate of state resources required to implement GHG regulations through the NAAQS program is not possible given the lack of specificity in the ANRP. TCEQ estimates that air quality planning and enforcement require at least 100 staff at an annual cost of $10-20 million. Added to this would be the cost of the Title V and PSD/nonattainment federal permitting programs. In the ANPR EPA estimated that the number of PSD permits required to be issued each year would increase by a factor of ten.[2] Assuming TCEQ's permitting load increases proportionately, this would require an additional 100 permit writers at an annual cost of $5-10 million annually. In the ANPR EPA also estimated that Title V sources would increase from 15,000-16,000 to 550,000

[2] 73 Federal Register 44499 (July 30, 2008)

nationwide.[3] If Texas saw a proportionate increase in Title V permit activity it would require 600-800 new Title V permit writers at a cost of $25-50 million annually. These numbers could change dramatically depending upon how the respective programs are implemented.

Hazardous Air Pollutants (HAP)

The FCAA is equally unfit to regulate CO_2 and other GHG as HAPs. The HAP program is intended to protect the public from exposure to air pollutant concentrations that would be hazardous to their health. Ambient CO_2 concentrations pose no threat to human health, CO_2 is not an EPA-recognized pollutant, and is not a hazardous compound. If designated as a HAP, the FCAA would require the development of maximum achievable control technology (MACT) requirements for any source that emits at least ten tons of CO_2 per year. Besides the previously mentioned newly regulated sources, this stringent limit would likely include large single-family homes that use natural gas for space and water heating and cooking.

On a stringent FCAA-mandated timeline, the EPA would be required to develop MACTs for all ten ton per year sources. If the EPA fails to develop these MACTs on time, the State would be required through the permitting process to develop case-by-case MACT requirements for any new sources. Again, these new sources would likely include office buildings, schools, hospitals, farms, and residences, entities not accustomed to obtaining air quality permits prior to construction.

Existing CO_2 sources would have to comply with the MACT requirements within an unreasonable amount of time specified in the FCAA. Sources may be required to install CO_2 controls (which have not been developed) or install new energy-efficient equipment. Another possible recourse is to switch from natural gas to electricity, causing further strain on the electricity generation system, which in turn could increase energy production and CO_2 emissions.

New Source Performance Standards (NSPS)

The NSPS program is used to regulate categories of stationary sources that EPA determines to cause or contribute to air pollution which may be reasonably anticipated to endanger public health or welfare. NSPS regulations would then be developed to cover these categories of sources. If NAAQS or HAP regulations do not exist, as in the case of GHG, then the NSPS regulations would cover existing, modified, and new sources. If GHG were regulated under the NAAQS or HAP program, then NSPS would cover only new or modified sources. The benefit of using the NSPS program is that the FCAA allows EPA to consider factors such as costs and energy requirements when establishing the NSPS. However, the potential universe of regulated entities is still very large and affects entities not previously regulated by the FCAA. The NSPS program requires EPA

[3] 73 Federal Register 44511 (July 30,2008)

to determine the best system of emission reduction which the EPA determines has been adequately demonstrated. Regulation under the NSPS program would trigger the requirement for new or modified sources to obtain PSD permits.

Prevention of Significant Deterioration (PSD) and Title V permitting

Using any part of the FCAA to regulate CO_2 and other GHG would trigger the need for many CO_2 sources to obtain federal prevention of significant deterioration (PSD) pre-construction and Title V permits.

PSD permits would be required of new sources of 100 tons of CO_2 per year from certain sources named by the FCAA or 250 tons per year of any other CO_2 source. According the EPA, the number of federal PSD permits issued nationwide would increase tenfold from 200-300 per year to 2000-3000 per year. In most cases, including Texas, state or local permitting agencies issue these permits.

This requirement would introduce many new source types to the time-consuming federal air quality permitting process, including control technology review and public notice and comment procedures. Existing sources that want to make changes may be required to get a federal permit first and may be required to install costly control technologies (which for the most part have not yet been developed), install costly new equipment, or switch from natural gas or other fossil fuels to electric-powered equipment.

Attempting to apply this permitting process, which was clearly intended for large industrial sources to smaller, often less-sophisticated, entities such as small businesses, office buildings, schools, hospitals, and farms would create many logistical problems. The process would introduce unprecedented delays and economic uncertainty into virtually every aspect of the United States (U.S.) economy. Inevitable legal challenges would further paralyze the process.

EPA estimates that states would be required to issue over 500,000 new Title V permits, up from the current universe of about 15,000 – 16,000 permits (pp 44511, ANPR). Besides additional delays and challenges navigating the bureaucratic process, Title V permits would introduce additional emission estimation processes, monitoring, record keeping, reporting requirements, and fees.

The costs of implementing these permitting programs cannot be accurately determined until more details are known. In the ANPR EPA roughly estimated that the number of PSD permits required to be issued each year would increase by a factor of ten.[4] Assuming TCEQ's permitting load increased proportionately, this would require an additional 100 permit writers at an annual cost of $5-10 million annually. EPA also estimated that Title V sources would increase from 15,000-16,000 to 550,000 nationwide.[5] If Texas saw a proportionate increase in Title V permit activity it would

[4] 73 Federal Register 44499 (July 30, 2008)
[5] 73 Federal Register 44511 (July 30,2008)

require 600-800 new Title V permit writers at a cost of $25-50 million annually. These numbers could change dramatically depending upon how the respective programs are implemented.

Impact on Texas Economy

Increased Energy Costs

Regulation of CO_2 under the FCAA will result in energy supply disruptions and higher energy prices. Higher energy prices have a significant impact on the Texas – and U.S. – economy, from various industries to the small business owner to the individual consumer.

Although prices have moderated with the national/global economic slowdown, sharp increases in the price of a barrel of oil and a gallon of gasoline have dominated recent headlines. Crude oil futures topped $100 per barrel in early 2008 for the first time, eventually exceeding the all-time inflation-adjusted high price of $103.76 set in April 1980. In June 2005, the national average retail price of gasoline was $2.16 per gallon. By June 2007, it had risen to $3.05, dropped to $2.80 in September 2007 and was up to $3.24 by March 2008. Since 2000, high energy prices (particularly natural gas) have cost the economy 2.8 million U.S. jobs. Since 2004, high energy prices have slowed U.S. economic growth by 0.5 to 1.0 percent.[6] According to Milton Copulos, former president of the National Defense Council Foundation and Senior Fellow at the Institute for the Analysis of Global Security, "[T]he supply disruptions of the 1970s cost the U.S. economy between $2.3 trillion and $2.5 trillion. Today, such an event could carry a price tag as high as $8 trillion – a figure equal to 62.5 percent of our annual gross domestic product (GDP), or nearly $27,000 for every man, woman and child living in America." [7] A reduction of as little as 10 to 15 percent in the energy supply could cripple oil-dependent industrial economies. In the 1970s, an energy supply reduction of just five percent caused energy prices to increase more than 400 percent. Energy supply disruptions due to FCAA regulation of GHG would have similar negative effects on the economy.

Importing More Energy

Sixty percent of the crude oil consumed in the U.S. is imported. Estimates indicate that by 2025, the U.S. will import 77 percent of the oil it needs. Nationally, the transportation sector accounts for nearly two-thirds of all oil consumption. Petroleum accounts for 97 percent of our transportation needs.

GHG regulation would increase the cost of developing and producing domestic energy supplies, leading to a greater dependence on foreign energy sources. Without similar regulation around the world, there will be no net reduction of GHG emissions. In addition, much of the oil we import is produced with lower environmental standards, posing a threat to ground and surface waters and air quality. Natural gas that is produced along with the oil but for which there is no market is combusted on site with a flare.

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[6] American Petroleum Institute, 7 September 2005, available from http://www.bipac.net/page.asp?g=api_alert&content=mms_background; Internet; accessed 9 January 2007.

[7] Copulos, Milton, Testimony before the Committee on Foreign Relations, United States Senate, 109th Congress, Second Session, March 30, 2006.

Every barrel of imported oil also must be transported in tankers across the sea, posing a risk to the world's shorelines as well as additional emissions from the transport.

Texas Agriculture

Key points

- More than 3,800 farms, 28,000 beef cattle operations, and 640 dairy operations would be affected in Texas.
- All stages of the agriculture production chain would be severely impacted by increased energy costs and/or regulatory burdens if GHG emissions were regulated under the FCAA.
- GHG regulation would affect not only the producers and processors but also the rural communities in which many of these businesses operate.

The Texas agriculture industry is a diverse sector that makes significant economic and conservation contributions to the state and nation. In 2007, cash receipts from the agriculture sector totaled $19.1 billion[8] creating an impact of $100 billion for the Texas economy.[9] More than 1.7 million Texans work in farm or farm-related employment, translating to 16.6 percent of Texas jobs.[10] Currently, Texas ranks third in the nation in total agriculture exports with goods valued at more than $5 billion.[11] Texas producers are key to responsibly managing our natural resources since they operate over 250,000 farms and ranches covering more than 129 million acres across the state.

Proposed GHG regulation under the FCAA creates great concern for the agriculture industry and could severely affect the sector's ability to continue providing the world's highest quality and most stable food supply. While complete data is not available at this time to derive the exact costs of regulation, given the size and diversity of the industry, all initial analyses indicate a devastating effect.

Recently, the U.S. Department of Agriculture completed a preliminary analysis of the potential impact of GHG regulation on small and mid-sized farm operations. Applying the study's methodology to the Texas agriculture industry, more than 3,800 farms, 28,000 beef cattle operations, and 640 dairy operations would be affected in Texas.

All stages of the agriculture production chain, from field preparation to transportation to market, could be severely impacted by increased energy costs and/or regulatory burdens if GHG emissions were deemed a pollutant under the FCAA. In crop production, for example, operation of irrigation pumps, fertilizer application, harvesting, processing and transportation activities may be subject to increased regulation, permits, and fees. The livestock industry may also be impacted. As the nation's top cattle producer, and a leading producer of poultry and pork, the livestock industry depends on heavy-duty

[8] USDA: National Agricultural Statistics Service, 2007
[9] Texas Department of Agriculture, November 29, 2007
[10] USDA: Economic Research Service, Texas State Profile, 2007
[11] USDA: Economic Research Service, Texas State Profile, 2007

trucks and trailers, animal feeding operations, and food processing facilities, which would certainly all be subject to and negatively impacted by GHG regulation.

Also, businesses that process agricultural products could be affected. For example, Texas cotton gins estimate the potential cost of permitting under new regulations at more than $8.5 million for 248 relatively small facilities. Other major producers and processors of agricultural products include biofuel production facilities, elevators and warehouses, and forest product manufacturing operations. GHG regulation would affect not only the manufacturers but also the rural communities in which many of these businesses operate.

Increased regulation will undoubtedly negatively affect farmers, ranchers, and agricultural product producers and processors by increasing business expenses (i.e., additional permitting fees, equipment installation, and changes in operating procedures) and input costs (i.e., increased costs for petroleum-based fertilizers, manufactured equipment, and electric energy). Smaller operations will be disproportionately affected as they will be less able to absorb related costs, with a possible result of further concentration in the industry. Additionally, an increased regulatory burden will raise the price of Texas agricultural products for consumers and make the industry less competitive in international markets.

Many sectors of the agriculture industry are currently subject to regulation under the FCAA and are implementing new technologies to promote human health and enhance our natural resources. Regulation of GHG should not be adopted until complete research and data are available to support the need for regulation and determine whether that need fully and adequately offsets the certain costs regulation would add to our basic necessities of food and fiber. If this effort continues, the U.S. Department of Agriculture must conduct a comprehensive analysis of the impact to agriculture to ensure all costs to our nation's agriculture producers are taken into account.

Energy Production

Key points

- Regulation of CO_2 under the FCAA would have a significant adverse impact on energy.
- Regulation of CO_2 under the FCAA will result in lost production of oil and natural gas.
- Regulation of CO_2 under the FCCA will create a disincentive for the use of coal and result in skyrocketing natural gas prices.

Oil and Natural Gas

Texas produces more oil and natural gas than any other state in the nation. Over 7000 companies operate 152,657 oil wells and 88,025 natural gas wells in Texas, producing

340 million barrels of oil (20 percent of the nation's oil production) and 7.0 trillion cubic feet (Tcf) of natural gas (38 percent of the nation's domestic gas production) in 2007.

Marginal oil and gas production[12] is a significant portion of our domestic energy supply and a significant portion of Texas' production. In 2007, 17.8 percent of the nation's oil production and 8.8 percent of natural gas production came from marginal wells. In Texas, more than one-third of statewide production comes from marginal wells.[13] While the per-well volumes are small, the shear number of marginal wells – 719,000 wells nationwide in 2007 – means that any regulation that decreases their productive life has a significant impact. Any measure that decreases production by one barrel of oil per well per month would result in a loss of more than five million barrels of oil each year.

Approximately 19.1 jobs are created for every million dollars of oil and gas production. In 2006, more than 312,000 Texans, or 3.1 percent of the state's work force, were directly employed in the oil and natural gas industry.[14] The Barnett Shale Trend, which has an estimated potential of 26 Tcf, alone resulted in creation of more than 100,000 jobs and over $10 billion annual output.[15]

Oil and natural gas production in Texas, although not as great as in the past, remains an important source of economic benefit, in terms of value, jobs created, and taxes. Historically, the oil and natural gas industry have accounted for approximately 10 percent to 25 percent of the state's Gross State Product (GSP). In 2007, with a taxable price of $72.00 per barrel, oil accounted for 15.7 percent of the GSP. According to the Texas Comptroller, the total economic value of oil and gas is 2.91 times the value of production. Assuming oil and natural gas prices of $66.05 per barrel and $6.6 per thousand cubic feet, and year 2006 annual production of 397 million barrels and 6.28 Tcf, wellhead value exceeded $67.5 billion. Annual natural gas value is currently 3.1 times that of the oil wellhead value to Texas. In terms of economic value trickled down through the Texas economy and jobs created, this figure equates to nearly $196 billion and over 1.3 million jobs. Severance, ad valorem, and indirect taxes provide additional economic benefits of more than $6 billion to Texas. The leasing of mineral rights to State- and University-owned lands statewide, moreover, provides royalty and leasing revenue that replenishes the Permanent University and School Funds, important sources of revenue for public education in Texas.

The federal and Texas state governments impose several major taxes on oil and gas production and consumption, in addition to receiving royalties, rentals and bonuses from the leasing of federally- or state-owned mineral ownership. Texas imposes severance taxes on the value of oil and gas produced in the state, which has been a major and relatively stable source of revenue until the last two decades. State government received

[12] Marginal wells are wells that produce relatively small quantities of oil and natural gas daily (10 barrels of oil per day or less or 60 thousand cubic feet per day or less.

[13] IOGCC's publication entitled "Marginal Oil and Gas: Fuel for Economic Growth."

[14] Texas Comptroller of Public Accounts, "Oil&GasEmplWages&GSPJAN2008," Austin, Texas, April 3, 2008. (Internal data with supplementary data from U.S. Bureau of Economic Analysis.

[15] The Perryman Group, Drilling for Dollars: An Assessment of the Ongoing and Expanding Economic Impact of Activity in the Barnett Shale on Fort Worth and the Surrounding Area, March, 2008.

increased tax revenues from the petroleum industry during the boom. In 1983, 28 percent of all tax revenue came from oil and gas operations. With the inclusion of federal payments, income from oil and gas taxes, mineral lease and bonus, and oil and gas royalties still comprised 17.16 percent of the revenues of state government. Severance, ad valorem, and indirect taxes provide additional economic benefits of more than $6 billion to Texas. In Texas also, annual total marginal oil production tax revenue in 2006 was $444,124,979 and annual total marginal gas production tax revenue was $160,024,732.

A modest increase in exploratory drilling in Texas of 20 percent for a single year could generate new revenues to the state of $60 million and these estimates are based on a very conservative assumed oil price of $32.50 per barrel.[16] The estimated net tax revenue effect at various percent increases in exploratory drilling is:

Percent Increase in Exploratory Drilling	10 percent	20 percent	30 percent
Net Annual Tax Revenue to State (millions)	$9.0	$37.5	$66.1

The leasing of mineral rights to State- and University-owned lands statewide, moreover, provides royalty and leasing revenue that replenishes the Permanent University and School Funds, important sources of revenue for public education in Texas.

Currently, Texas also leads the nation in the consumption of petroleum products for many reasons, including the state's reliance on electricity generated by natural gas for air conditioning, and for its energy-intensive refineries and petrochemical plants. Energy demand in Texas is forecast to grow 31 percent by 2025, from 11.6 to 15.2 quadrillion Btus per year, with the largest increases being in motor gasoline and transportation distillates.

Coal

The U.S has more than a 250-year supply of coal, which currently costs less than natural gas. According to the National Center for Policy Analysis, "The use of coal is an enormous economic benefit for the U.S. as it provides over $1 trillion in GDP, $360 billion in additional household income, and over 7 million jobs for Americans. The proposed regulations in the ANPR would substantially reduce the production of coal based energy in the U.S. and thus the vitality of the U.S. economy. A 66% reduction in coal-fired power generation would reduce GDP by $371 billion, household income by $142 billion and employment by 2.7 million."[17]

[16] The Texas Energy Plan 2005, Texas Energy Planning Council, December 2004.

[17] Burnett, H. Sterling, Ph.D., Comments on the Advanced Notice of Proposed Rulemaking by the Environmental Protection Agency, National Center for Policy Analysis, Dallas, Texas, September 16, 2008.

Texas is the fifth largest producer of coal in the nation. Coal mining and coal-fueled electric generation account for over 33,000 direct jobs, almost $10.5 billion annually in total expenditures, and more than $300 million in annual state and local revenue. In many counties, taxes from mining and power generation contribute over half of the funds for county services as well as school district operations. The majority of Texas' coal mines are located in East Texas, where coal mining supports about 7210 jobs, $154 million in annual retail sales and $1.4 billion in total expenditures. Workers at the mines earn an average annual salary approximately 114 percent of the statewide average for all occupations.[18]

Texas has been the largest consumer of coal in the U.S. since 1981. In 2002, Texas accounted for about 9 percent or 99.32 million tons of total domestic consumption.[19] Almost all (99.9 percent) of the 48.18 million tons of lignite mined in Texas is used to generate electricity for the Texas market. The balance of Texas coal consumption, which is about 55 percent or 51.14 million tons, is imported from Wyoming, Colorado and Utah.

Regulation of GHG through the FCAA would act as a barrier to domestic energy production. Such costly regulation would reduce the ability of Texas to provide energy to the nation. Texas has created over half of all new private sector jobs over the last year. Stifling the Texas energy industry would adversely impact Texas' ability to create new jobs; thereby, affecting the economy at the local, state, and national level.

Texas Electricity Generation

Key Points

- FCAA regulation of CO_2 could have a significant impact on the electric power industry in Texas and, ultimately, on residential, commercial, and industrial consumers.
- FCAA regulation of CO_2 would create a disincentive to the use of coal and create a greater demand for natural gas, resulting in a marked increase in the price of both natural gas and electricity.
- The early retirement of coal-fired power plants and other older power plants could result in electricity reliability problems.
- Increased energy cost would reduce real economic output, reduce purchasing power, and lower aggregate demand for goods and services.
- The increase in energy prices would reduce gross state product by between $12 and $16.6B per year by 2020 and $44.2 and $52.2B by 2030.

[18] Governor's Clean Coal Technology Council of Texas, Clean Coal: The Key to Affordable Electricity in Texas, March 2005.
[19] Sources: NMA, DOE EIA

Coal is used to generate about half of the U.S. electrical supply. Texas and much of the U.S. is gradually using newer technology to decrease emissions from coal, however, studies by the U.S. Department of Energy indicate that carbon capture and sequestration (CCS) with today's technology is expensive and would result in electricity cost increases on the order of 30 to 90 percent above the cost of electricity produced from new coal plants built without CCS.[20] Texas has plans to encourage the development of coal gasification technology associated with CCS to make coal gasification competitive with natural gas-fired electricity. However, imposition of FCAA regulations for CO_2 would create a disincentive to the use of coal and create a greater demand for natural gas, resulting in a marked increase in the price of both natural gas and electricity.

According to the National Center for Policy Analysis, "The use of the CAA to regulate GHG emissions from stationary sources would cause a dramatic shift away from coal, which is currently used to generate about half of the domestic electricity supply, and towards natural gas. Without rapid deployment of carbon capture and storage technologies and a significant expansion of domestic nuclear power production, the increased demand for natural gas will cause its price, and consequently the price of electricity, to skyrocket. Based on analysis of recent climate change legislation, natural gas prices could increase as much as 108% to 146% and electricity prices by 101% to 129% by 2030."[21] Another estimate is that a 66 percent reduction in coal-fired power generation would reduce GDP by $371 billion, household income by $142 billion and employment by 2.7 million.[22]

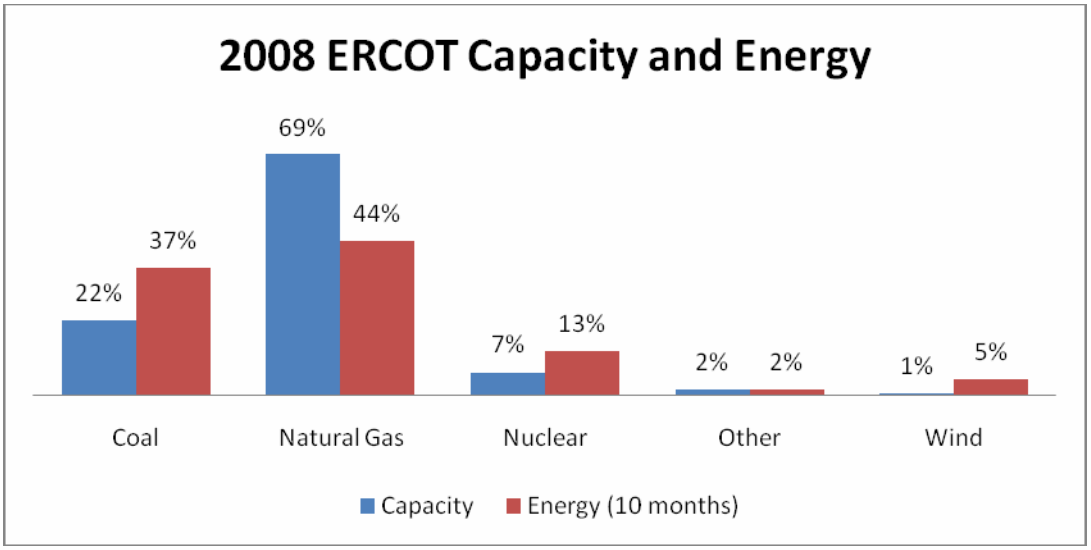
Besides the negative economic impact of regulations that discourage the use of coal in favor of less carbon-intensive fuels, this trend would also be detrimental to efforts to decrease our dependency on foreign energy supplies. A shift from coal to natural gas would require either an increase in domestic natural gas production or a greater reliance on imported natural gas. While the U.S. has extensive natural gas reserves, the majority of global natural gas reserves are in Russia and the Middle East. Coal is a key component to maintaining U.S. fuel diversity, protecting consumers and industry from energy supply shortages and price fluctuations.

Data from the EIA show that the electric power industry in Texas accounts for about 37 percent of the total Texas CO_2 emissions.[23] As shown in the chart, Texas relies heavily on both coal and natural gas.[24] In the Electric Reliability Council of Texas (ERCOT) region, coal represents 22 percent of installed generating capacity but because it is used in "base load" plants that operate on a continuous basis, it accounts for 37 percent of the

[20] DOE/NETL Report: "Cost and Performance Baseline for Fossil Energy Plants," May 2007.
[21] Burnett, H. Sterling, Ph.D., Comments on the Advanced Notice of Proposed Rulemaking by the Environmental Protection Agency, National Center for Policy Analysis, Dallas, Texas, September 16, 2008.
[22] DOE/NETL Report: "Cost and Performance Baseline for Fossil Energy Plants," May 2007.
[23] Data for 2005 can be found under "Emissions Detail by State" at: http://www.eia.doe.gov/environment.html.

[24] Electric utilities in the non-ERCOT areas of Texas also rely heavily on coal and natural gas, although not all of their generating plants are located within the state.

energy consumed. Natural gas, which can be used in base load, intermediate, or peaking generating units, accounts for 69 percent of the capacity and 44 percent of the electric energy consumed.[25]



Because Texas relies on coal and natural gas for 91 percent of its electric capacity and 81 percent of its electric energy, CO2 regulation would have a substantial material impact on the electric power industry in Texas and, ultimately, on residential, commercial, and industrial consumers and the state economy. Though no specific emission reduction targets were identified in the ANPR, the following analysis illustrates the implications if strategies similar to S. 2191 were implemented.

Several bills have been proposed at the national level to regulate GHG. None of them is expected to be adopted in the current Congress, but global warming is likely to be a priority issue in the next Congress. One of these bills was the focus of legislative action in the current Congress and was subject to several economic analyses.

The bill that was debated in the Senate is the Lieberman-Warner Climate Security Act of 2007 (S. 2191/3036). The bill would cover 87 percent of GHG emissions in 2006 as reported by the EIA. It would require reductions to the 2005 GHG level of 15 percent by 2020, 30 percent by 2030, and 70 percent by 2050. To achieve these reductions, the bill would establish a market-driven cap and trade system for emission allowances. Entities covered by the program, which includes electric generators, would submit to EPA at the end of each year a number of emission allowances that accounts for all of the metric tons of CO_2 equivalents that the facility emitted in that year. The number of available allowances would decline from 5.2 billion in 2012 to 1.56 billion in 2050. Allowances would be allocated and auctioned, but the share of allowances to be auctioned would increase each year. Allowances would be tradable and bankable.

[25] The capacity percentages assume that wind is rated at its effective load carrying capability, which is 8.7 percent of nameplate capacity. Wind capacity is discounted because it is only available to the extent that the wind is blowing when the electricity consumption on the system is at its peak.

Various parties, including EIA, EPA, and the American Council for Capital Formation along with the National Association of Manufacturers, have analyzed the potential energy market and economic impact of S. 2191. EIA developed a base case of energy regulation and applied its projections for energy prices, demand, and other factors addressed in its Annual Energy Outlook 2008 (AEO2008), a "core" GHG regulation case based on S. 2191 and key assumptions about the timely development and deployment of low-emissions technologies. It developed several other cases with differing assumptions. EIA found that S. 2191 would significantly reduce projected GHG emissions. Its key findings with regard to the electric power industry can be summarized as follows:

- The electric power sector accounts for the vast majority of the emissions reductions. It accounts for between 82 percent and 87 percent of energy-related CO_2 emissions reductions in 2020 and between 82 percent and 92 percent of such reductions in 2030. Emission reductions in the residential, commercial, industrial, and transportation sectors would be small relative to those in the electric power sector.
- If new nuclear, renewable, and fossil plants with carbon capture and sequestration (CCS) are not developed and deployed in a timely manner, natural gas use will be increased to offset reductions in coal generation, resulting in markedly higher delivered prices of natural gas.
- Total coal consumption would be substantially reduced. The addition of up to 64 gigawatts of new coal capacity with CCS by 2030 is not sufficient to offset the reduction that occurs because of the retirement and reduced utilization of existing coal plants. To offset the reduction in coal use, the power industry must increase its use of nuclear power, renewable fuels, and natural gas.
- S.2191 increases energy prices and energy bills for consumers. Relative to the base case, the price of using coal for power generation, including the cost of holding allowances, is between 161 percent and 413 percent higher in 2020 and between 305 percent and 804 percent higher in 2030 in the S. 2191 cases. The price of electricity is between 5 percent and 27 percent higher in 2020 and between 11 percent and 64 percent higher in 2030. The average annual household energy bills, excluding transportation costs, are between $30 and $325 higher in 2020 and $76 to $723 higher in 2030.
- S. 2191 increases the cost of using energy, which reduces real economic output, reduces purchasing power, and lowers aggregate demand for goods and services. Total discounted GDP losses over the 2009 to 2030 time period range from $444 billion (-0.2 percent) to $1,308 billion (-0.6 percent) across the S. 2191 cases. Similarly, the cumulative discounted losses for personal consumption range from -0.2 percent to -0.6 percent.

Like the EIA study, the EPA study also found that the greatest emission reduction under S. 2191 occurs in CO_2 emissions from the electricity sector. On a regional basis, EPA found that the largest GDP and consumption impacts are in the Plains region, which includes Texas. The differential impact was driven by regional differences in energy and

manufacturing industry composition, energy use patterns including household heating and cooling needs, average distance traveled, and existing fossil fuel capacity in the electricity sector. Thus, with its high level of energy production and energy-intensive manufacturing industries, long driving distances, and substantial reliance on air conditioning, Texas would experience significant impacts on GDP and consumption.

The American Council for Capital Formation (ACCF) and the National Association of Manufacturers (NAM) also analyzed S. 2191 using the National Energy Modeling System (NEMS) model, which is the model used by the EIA for its energy forecasting and policy analysis. The ACCF and NAM applied assumptions about the cost and availability of new energy technologies, oil prices, and other key factors. The study estimated that the emissions allowance price needed to reduce energy use to meet the S. 2191 targets is $55 to $64/metric ton of CO_2 in 2020, rising to between $227 to $271/metric ton of CO_2 in 2030. It also found:

- Nationally, natural gas prices are expected to increase by 26 percent to 36 percent in 2020 and 108 percent to 146 percent in 2030. Electric prices are expected to increase by 28 percent to 33 percent in 2020 and 101 percent to 129 percent in 2030.

- In Texas, electricity prices are estimated to increase by 32 percent to 35 percent by 2020, and 101 percent to 145 percent by 2030, and natural gas prices are estimated to increase by 25 percent to 36 percent by 2020, and 101 percent to 145 percent by 2030. The increase in prices would reduce gross state product by between $12 and $16.6B per year by 2020 and $44.2 and $52.2B by 2030.

Electric Reliability

EIA and other studies indicate that GHG legislation may result in early retirement of older power plants, especially coal-fired plants. As noted earlier, 22 percent of the capacity and 37 percent of the energy in ERCOT is provided by coal-fired generation. In addition, there is about 3,300 MW of coal capacity currently under construction in ERCOT. None of the old plants or the new plants includes CCS capability, and the EIA study assumed that it would not be economic to retrofit CCS on older coal units.[26] Senate Bill 2129 includes a number of phase-in provisions, such as escalating reductions of GHG emissions and declining levels of allowances that are allocated to emitters. These provisions recognize that existing technologies for producing electricity will have to remain in service for some time and that it will take time to develop low-emission technologies and CCS. Coal generation would have to be reduced over time, but it is possible that early retirement of these coal units would be required, depending on the schedule for reduction of GHG emissions that is adopted in the legislation.

[26] NRG Energy has announced plans to build a CO_2 capture and sequestration demonstration project at its W.A. Parish plant near Houston.

Early retirements of coal units could result in resource adequacy concerns. If the existing coal capacity becomes uneconomic, based on the cost of GHG taxes or allowances, it could be retired before the end of its productive life, and it might be difficult if not impossible for the market to respond in a timely manner to provide replacement resources. Nuclear plants take a long time to build and may continue to be a controversial source of energy. Natural gas plants can be built more quickly, but expanding this capacity, as EIA noted, will likely drive up the price of natural gas and imported LNG.

Early retirement of older generating facilities could result in reliability problems with regard to the transmission system. Whatever facilities are built to replace early retirements may be sited in different locations than the retiring facilities, probably requiring new transmission to be built to those locations. Transmission projects can easily take from three to five years from the identification of the need to finished construction. Therefore, even if a new gas plant could be built to replace a retiring coal plant, adequate transmission may not be available when the plant comes on line.

The North American Electric Reliability Council (NERC) has just issued a special report of electric industry concerns on the reliability impacts of climate change initiatives.[27] The report emphasizes that the combined effect of federal climate change legislation, state renewable portfolio standards (RPS), and other state and regional climate initiatives will be among the most important emerging issues facing the reliability of the bulk power system in the coming years. The report discusses the impact of broad-scale fuel switching from coal to natural gas, the need for innovative resource planning and implementation for transmission infrastructure, and the importance of effectively integrating demand-side resources into the resource mix.

Competitive Market

As noted above, the EIA study included a core case and several alternative cases. EIA observed that in cases where adequate alternatives to coal generation do not exist, regions of the country that have competitive markets may see greater price increases:

> …all regions are expected to see price increases in most of the S. 2191 cases. Competitively priced regions such as the Electric Reliability Council of Texas, the Mid-Atlantic Area Council, New York, and New England see especially large increases in the S. 2191 cases where alternatives are limited, because the high costs of allowances in those cases are passed directly through to consumers as higher marginal generating costs. In contrast, cost-of-service based regions with little reliance on coal, such as California, see much smaller price increases. In the S. 2191 Core Case, where all generating alternatives are available at the costs consistent with those of a few years ago, a couple of regions could have fairly small price increases or even small price declines in the later years relative to the

[27] Special Report: Electric Industry Concerns on the Reliability Impacts of Climate Change Initiatives, North American Electric Reliability Corporation, November 2008.

Reference Case, because the stimulus to build nuclear and renewables drives their costs down over time.

Because ERCOT is a competitive market with significant coal generation, this scenario could result in substantial increases in electricity prices that would not be felt in some other regions of the country. While a number of uncertainties exist about what would be included in GHG legislation, but there are also uncertainties about electric generation alternatives in a future with GHG regulation. Critical unknowns include the rate at which alternative low-GHG technologies and CCS can be developed. These unknowns are treated through alternative assumptions about the viability of future generating alternatives and have a major impact on the estimated impacts of GHG legislation.

Texas Refining and Chemical Industry

The Texas manufacturing sector is diverse. The petroleum refining and chemical industries in Texas are the largest of any state in the U.S. and are essential to the economy of both Texas and the nation. One only has to look at the nationwide gasoline shortages and price increases that Hurricane Ike caused in shutting down Texas refineries to see how important Texas industry is to the nation.

Petroleum is the single largest source of energy used in the U.S. The nation uses two times more petroleum than either coal or natural gas and four times more petroleum than nuclear power or renewable energy sources. According to the EIA, the U.S. petroleum industry is a strong contributor to the economic health of the U.S., providing $219 billion in annual shipments and employing over 101,000 people in 2001.[28] Petroleum refining is the most energy-intensive manufacturing industry in the U.S. and accounts for about 7.5 percent of total U.S. energy consumption. While energy costs vary widely among petroleum products, they can be substantial in some cases, accounting for up to 85 percent of production costs. In 1998, the industry spent about $4.5 billion on purchased energy, $2.2 billion of which was spent on natural gas. These figures do not include the value of energy produced onsite, which could be more than $9 billion. In 2008, Texas petroleum refineries accounted for over 27 percent of the nation's petroleum refining capacity. The value of Texas petroleum product shipments was almost twice the amount of the next highest state and was over 62 billion dollars. The Texas petroleum refining industry employed 20,000 people in 2000.

The chemical industry is also a major contributor to the U.S. economy, providing 2 percent of the total U.S. GDP and nearly 12 percent of the manufacturing GDP. On a value-added basis, the chemical industry is the largest U.S. manufacturing sector. According to the EIA,[29] the industry employed nearly 900,000 people in 2001, including nearly 85,000 scientists, engineers, and technicians engaged in R&D. The chemical industry uses energy both to supply heat and power for plant operations and as a raw material for the production of petrochemicals, plastics, and synthetic fibers. According to

[28] http://www.eia.doe.gov/emeu/mecs/iab98/petroleum/index.html
[29] http://www.eia.doe.gov/emeu/mecs/iab98/chemical/index.html

the most recent Manufacturing Energy Consumption Survey, the U.S. chemical industry consumed about 6.1 quads (quadrillion Btu, or 10^{15} Btu) of energy in 1998. This represents about 6 percent of domestic energy use and about 25 percent of all U.S. manufacturing energy use. Energy purchases cost the industry about $22 billion in 1998, about 5 percent of the value of shipments that year. The chemical industry uses a variety of fuel sources, 45 percent of which are used as feedstock. The industry is the largest single consumer of natural gas (over 26 percent of the domestic manufacturing total) and uses virtually all (95.4 percent) the liquefied petroleum gas (LPG) consumed in U.S. manufacturing. Nearly all LPG and about one fourth of natural gas are used as feedstock. Other energy sources include byproducts produced onsite, hot water, and purchased steam.

Texas is also home to the largest concentration of the chemical manufacturing industry in the nation. The Texas chemical industry accounts for over 70 billion dollars in the value of shipments, over twice the amount of the next highest state and employs over 80,000 people. The increased cost of energy that would result from regulating GHG under the FCAA will have significant negative economic impacts on both of these industries and to consumers who rely on their products on a daily basis. Due to the concentration of these industries in Texas, there will be a disproportionate impact to Texas.

Reasons to Exercise Regulatory Restraint

State of the Science

An examination of the science behind the global warming theory is beyond the scope of this report. However, recent climate research calls into question prevailing public perceptions of the cause and extent of global warming. In an "Open Letter to the Secretary-General of the United Nations,"[30] one hundred prominent scientists presented a succinct summary of their concerns about going forward with regulation before the science is better understood: "In stark contrast to the often repeated assertion that the science of climate change is 'settled,' significant new peer-reviewed research has cast even more doubt on the hypothesis of dangerous human-caused global warming." Any new regulation of CO_2 emissions should be based on the best science possible.

Carbon Dioxide

The FCAA was specifically designed to allow for regional control of air pollution. A major component of pollution control is the development of a protective standard and a mechanism for demonstrating compliance. Although the FCAA state implementation plan (SIP) development process in Texas could be streamlined and improved, it has lead to dramatic measurable ozone reductions in nonattainment areas. Regulating carbon dioxide (CO_2) under the same strategy will not work practically or theoretically.

CO_2 exists uniformly throughout the earth's atmosphere. Developing a protective standard in several areas of the state is simply not feasible. Any reduction in CO_2 emissions within a certain region will be immeasurable in the ambient air of the region. If the goal of reducing GHG under FCAA is a reduction in global warming, there is no way for states or EPA to verify that controls in place in a certain region of a state have an effect on global climate or temperature.

Once energy efficiency, fuel switching, and certain renewable energy sources (e.g., wind and solar) have been addressed to the fullest practical extent, the most likely method currently available to limit CO_2 emissions is to reduce energy consumption which will reduce economic activity. While Texas continues to focus on development of innovative technologies to capture and sequester CO_2, these technologies are largely untested as a control strategy and unavailable to many CO_2 emitters. For those sources for which carbon dioxide sequestration is an option, the current process (capturing, purifying, transporting, and injection) is costly and energy intensive, thus partially defeating the purpose of the controls.

[30] Don Aitkin, PhD, Professor, social scientist, retired vice-chancellor and president, University of Canberra, Australia, et. al. Open Letter to His Excellency Ban Ki-Moon (Secretary-General of the United Nations) 13 December 2007. Retrieved from: http://scienceandpublicpolicy.org/reprint/open_letter_to_un.html

Other Greenhouse Gases

The ANPR addresses six GHG: CO_2, methane, nitrous oxide, hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride. Most of this report deals with CO_2 because CO_2 has been the focus of most analysis to date. However, according to the United Nations Intergovernmental Panel on Climate Change[31], CO_2 has the lowest global warming potential (GWP) of the six. The ANPR does not address water vapor, which is by far the most abundant and important GHG in the atmosphere. According to Freidenreich and Ramaswamy, water accounts for about 90 percent of the Earth's greenhouse effect – approximately 70 percent due to water vapor and about 20% due to clouds.[32]

Based on concentrations (part per billion) adjusted for heat retention	[32] Percent of All GHG	[32] Percent Natural	[32] Percent Man-made	[31] Global warming potential
Water vapor	95.000	94.999	0.001	---
Carbon dioxide	3.618	3.502	0.117	1
Methane	0.360	0.294	0.066	21
Nitrous oxide	0.950	0.903	0.047	310
Miscellaneous gases (CFC, PFC, sulfur hexafluoride.	0.072	0.025	0.047	140 to 23,000
Total	100.000	99.720	0.280	

[31] Forster, P., V. Ramaswamy, P. Artaxo, T. Berntsen, R. Betts, D.W. Fahey, J. Haywood, J. Lean, D.C. Lowe, G. Myhre, J. Nganga, R. Prinn, G. Raga, M. Schulz and R. Van Dorland, 2007: Changes in Atmospheric Constituents and in Radiative Forcing. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. (www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf)

[32] Freidenreich, S.M. and V. Ramaswamy, 1993 "Solar Radiation Absorption by Carbon Dioxide, Overlap with Water, and a Parameterization for General Circulation Models," Journal of Geophysical Research 98: 7255-7264

Ongoing GHG Emission Reductions

Texas has already taken a number of actions that have and will continue to reduce GHG emissions in the future, including the development of renewable energy, energy efficiency programs, and the development and promotion of market-based solutions, such as advanced meters to give consumers more information about their electric consumption.

Renewable Energy and Other Alternatives

Some forms of renewable energy, such as wind and solar, provide a way to generate electricity without emitting GHG and without using limited resources such as natural gas and water. In 1999, the Texas Legislature adopted a Goal for Renewable Energy that has resulted in Texas currently having more than 6,000 megawatts (MW) of installed wind capacity, far more than any other state and most other countries. Texas expects to have more than 8,000 MW of wind capacity installed by the end of 2008. In spite of this leadership position, the electricity production from wind and other renewable resources still represents only about five percent of the electric energy generation in Texas.

In 2005, the Texas Legislature directed the Public Utility Commission (PUC) to designate Competitive Renewable Energy Zones (CREZ) in the state and develop a plan to construct transmission capacity necessary to deliver renewable energy in a cost-effective manner to end-use customers. The Commission has designated five areas as CREZs and identified the major transmission improvements that would be necessary to deliver 18,456 MW of renewable resources from the CREZs, roughly three times the current renewable capacity. The Texas renewable energy sector is expected to continue to grow, with the expectation that it will reach the 18 gigawatt level in the 2013 timeframe.

Energy Efficiency

Texas mitigates CO_2 emissions through deployment of energy-efficient, clean energy technologies and practices, programs and policies. Approximately 88 percent of the electricity in Texas is generated by fossil fuel combustion, so less electricity demand usually results in less power plant CO_2 emissions. Energy efficiency measures can also reduce the amount of natural gas used directly in homes and businesses.

Texas has a successful utility energy efficiency program that is reducing energy consumption, peak demand, and GHG emissions. Legislation enacted during the 80th Texas Legislative Session raised the electric utilities' energy efficiency goals from the current goal of ten percent of growth in demand to fifteen percent of growth in demand in 2008, and to twenty percent of growth in demand in 2009. The Texas Legislature has also adopted goals for units of local government to improve the energy efficiency of their operations, and many cities, counties, and school districts are making improvements in this area. Finally, the PUC was directed to provide reports to the next Legislature on the

feasibility of higher energy-efficiency goals (30 percent of growth in demand by 2010 and 50 percent of growth in demand by 2015) and producing more energy through efficient combined heat and power technology.

Advanced Metering

As the population in Texas continues to grow, electric demand in the ERCOT region will increase. Diverse electric generation is necessary to supply that growth, but advanced metering will give Texas residential customers additional tools to make informed decisions about their electric use and the ability to better control consumption.

Advanced meters for electricity consumption have been developed to record consumption at short intervals, store the consumption information, transmit the information to the utility's billing system automatically, and provide consumption information to the customer in near real time. Advanced metering being deployed in Texas will give residential customers additional tools to make informed decisions about their electric use and the ability to better control consumption, which should permit them to use electricity more efficiently and use less energy to meet their lighting, comfort, and other needs. With better information, customers can choose to reduce their consumption during daily and annual peak periods, which will lower their cost and reduce reliance on peaking generation facilities that are typically the least efficient and have higher GHG impact per kilowatt-hour.

Other Energy Efficiency Efforts

The Texas State Energy Conservation Office (SECO) administers and is involved in a number of programs that encourage energy efficiency.

- Texas statute[33] requires affected political subdivisions to implement all cost-effective energy-efficiency measures, establish a goal to reduce electricity consumption by five percent each year for six years and report efforts and progress annually to the State Energy Conservation Office (SECO). SECO provides personalized on-site technical assistance to local governments and municipalities to assist in energy efficiency efforts.

- The 70th Texas Legislature authorized adoption of energy conservation design standards. The Energy Conservation Design Standard for New State Buildings, based on the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 90.1 and commonly referred to as the "Texas Standard," was developed to respond to this directive. Originally adopted in June 1989, the standard was revised in May 1990 and February 1993.

[33] Texas Health and Safety Code, 388.005. Energy Efficiency Programs in Certain Governmental Entities

- The LoanSTAR Energy Efficiency Financing Program[34], administered by SECO, is a revolving loan program that has saved taxpayers more than $200 million through energy-efficiency projects for state agencies, institutions of higher education, school districts, county hospitals, and local governments. Loans are repaid through cost savings generated by the projects. SECO estimates that LoanSTAR-funded projects have prevented the release of 2.1 million tons of carbon dioxide (CO_2).

- Texas Executive Order RP49, issued in 2005, created the *State Agency Energy Savings Program.*[35] Each state agency is required to:
    - Develop a plan for conserving energy;
    - Set a percentage goal for reducing its usage of electricity, gasoline, and natural gas;
    - Submit the energy conservation plan to the Office of the Governor and the Legislative Budget Board no later than December 1, 2005;
    - Report back to the Office of the Governor and the Legislative Budget Board with goals achieved, and ideas for additional savings on a quarterly basis, with the first quarterly report shall be due no later than April 1, 2006; and
    - Post its report in a conspicuous place on its internet site for public inspection.

- Texas Industries of the Future[36] is a partnership strategy of the U. S. Department of Energy (DOE) Industrial Technologies Program (ITP) and SECO. Texas Industries of the Future conducts conferences, workshops and forums, providing training and outreach to engineers and consultants in process industries on a variety of industrial energy-efficiency topics.

- Under the Save Energy Now program,[37] US DOE energy experts or the university-based Industrial Assessment Centers assessed plants and identified near-term opportunities for saving energy. In 2008, 23 Texas sites were recognized by DOE and SECO as Champions and Savers for their achievements in energy efficiency in the Save Energy Now program. Together these plants have saved a total of 1.8 trillion Btus per year.

- During Memorial Day weekend, Texas shoppers do not have to pay state and local sales taxes when they purchase certain energy efficient appliances and other household equipment bearing an Energy Star label.[38]

[34] Authorization: government code, section 2305.032. LoanStar Revolving Loan program
[35] Authorization: Health And Safety Code, 388.005. Energy Efficiency Programs In Certain Governmental Entities
[36] Authorization: Government Code, Section 2305.033. State Energy Program
[37] Authorization: Government Code, Section 2305.033. State Energy Program
[38] Authorization: Tax Code, Section 151.333. Energy-Efficient Products

- In 2008, the SECO launched the Texas Agricultural Technical Assistance Program,[39] which provides Texas agricultural producers with free technical assistance to improve energy efficiency in farm buildings, facilities, and equipment.

Nuclear Energy Development

While a greatly expanded nuclear generating fleet could help, there seems to be no concerted federal effort to make this happen. In the last legislative session, Texas took several steps to help facilitate the development of these plants including efforts toward insuring adequate decommissioning funds. Three separate generating entities (NRG Energy, Exelon, and Luminant) have filed applications with the Nuclear Regulatory Commission (NRC) to develop new nuclear generating plants in Texas. If these units come to fruition, Texas will add approximately, 10,000 megawatts of zero carbon generation for a total of almost 15,000 MW.

[39] Authorization: Government Code, Section 2305.033. State Energy Program