The Obama Administration's Clean Energy Policies:

U.S. Energy and Policies, Past, Present, and Future and their Implications for the Republic of Korea

A report for the Ministry of Knowledge Economy, Republic of Korea

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EXECUTIVE SUMMARY

The purpose of this report is to examine the new Obama Administration's options for "clean energy" policies for the United States. It explores these policies within the context of U.S. energy sources of past and present and how the U.S. is seeking to transition to more energy efficient systems and ones that promote "energy independence" by eliminating the nation's dependence on foreign sources of energy, primarily petroleum. The report highlights numerous public-private partnerships in the development of clean energy technologies and efforts to establish a nationwide energy economy. It also examines the Obama Administration's "clean energy" policies and their implications for the local, state, and national governments and as incentives for foreign trade and investment. Lastly, the report explores the similarities of the U.S. "clean energy" policies to South Korea's "Green New Deal" and the possibilities of trade and collaborations between Korean and American companies.

Proposals for a "clean energy economy" have been gathering increased attention in recent years as the United States and the world face serious economic and environmental challenges. In fact, all states have adopted plans to pursue a future economy based upon clean energy industries and jobs. Investments in clean energy technology are doing well despite problems in other areas of capital investments, thus indicating a promising future for clean energy.

The popularity of clean energy jobs is becoming more evident. This has been motivated by increased concerns about the U.S.' increasing appetite for foreign sources of energy, principally oil; the threat to the nation's security due to that dependency; and the growing concern about short- and long-term environmental impact of current energy sources. A study by the Pew Center on the States concluded that between 1998 and 2007, clean energy economy jobs, including a mix of white- and blue-collar positions, grew 9.1 percent, while total jobs in the U.S. grew by only 3.7 percent. It also concluded that there has been growing interest in and financial investment from the public and private sectors in a clean energy economy for the future, which hints at the potential for significant growth in the years to come. For example, venture capital investment in clean technology surpassed $1 billion in 2005 and has grown significantly, totaling more than $12.6 billion over the past three years. [Pew, 3] As a result of the American Recovery and Reinvestment Act (ARRA) passed by Congress and signed by President Obama earlier in 2009, clean energy received a boost of some $85 billion in direct spending and tax incentives for energy- and transportation-related programs.

The Pew Center on the States indicated that every state in the U.S. has a part of America's growing clean energy economy. Texas, for example, generates more power from wind than any other state; Tennessee has established itself as a leader in recycling, waste treatment, and other conservation industries; Colorado has increased the amount of power that electricity providers must supply from renewable energy sources to stimulate job development in solar and wind power industries. The State of Indiana possesses a large and growing component of clean energy programs, having added more than 17,000 jobs in 2007. According to the Pew Center for the States, Indiana is one of seven states and District of Columbia where the total number of jobs fell but jobs in the clean energy sector increased between 1998 and 2007. Indiana's jobs in the clean

energy economy grew by 78 percent during that time, attributed in part to the rapid growth in the wind power industry, the development of biofuels, and the emergence of new battery technology companies. [For a comparison of all states, see the Pew report: http://www.pewcenteronthestates.org/uploadedFiles/wwwpewcenteronthestatesorg/Fact_Sheets/Clean_Economy_AllFactsheets.pdf]

The development of public policies at the state level indicates the growing presence and importance of the clean energy economy. For the past decade, states have developed comprehensive energy plans, promoted research and development in renewable energy, explored alternative fuels, and established job training programs to assist the current workforce in transitioning to a clean energy economy. It is not known at this point to what degree these state-level initiatives will have on job growth nationwide, but they have provided significant incentive for the public and private sectors to invest in the development of new technologies and infrastructures as evidenced by increasing research at state universities and clean energy companies.

Particular state policies that have advanced the clean energy economy include:

- Financial incentives such as tax credits to encourage businesses and individuals to use renewable energy or to adopt energy efficiency systems; special loan programs to finance the purchase of energy efficient systems; and other forms of credits or rebates to install solar water heating or solar panels.
- Energy efficiency standards that seek to make buildings, homes, and vehicles more energy efficient.
- Renewable energy portfolio standards that require electricity providers to offer a certain amount of power from renewable energy sources.
- Initiatives that seek to reduce carbon emissions from factories and power plants.

To illustrate the steps taken by certain states in advancing a clean energy economy, this report includes a case study of the State of Indiana. It highlights the ways in which Governor Mitch Daniels and different departments of state government are promoting policies and encouraging economic development that will contribute to a sizeable growth of clean technology and clean jobs in the state. Among the significant developments in Indiana in recent years are the construction of numerous biofuel plants, the opening of new battery technology research and development facilities, and the erection of large wind farms, which has earned Indiana recognition as a leader in wind energy production.

The federal government also has been instrumental in adopting policies and investing funds for research and development in clean energy technologies. The U.S. Department of Energy has appropriated funds to develop new forms of clean energy technologies; helped manufacturers to improve their efficiency and reduce waste; adopted energy standards for home appliances and lighting; among others. In the past five years, the federal government has begun to establish more rigorous fuel efficiency standards for vehicles. In 2007, President George W. Bush signed into law the first congressionally mandated increase in fuel efficiency standards for cars and light trucks in more than 30 years. President Barack Obama set new standards for the nation's

vehicles in May 2009 by adopting more rigorous efficiency standards that had been adopted by the State of California.

The most important recent federal policy, however, has been the American Recovery and Reinvestment Act (ARRA), signed by President Obama in February 2009. This federal stimulus bill includes a wide array of investments to promote clean energy generation, energy efficiency, and job creation nationwide. The bill appropriates about $85 billion for energy- and transportation-related spending with a priority given to renewable energy sources. Other provisions include more than $30 billion for clean energy programs, including $11 billion to modernize the electricity grid; $2 billion for advanced battery technology; more than $6 billion for state and local efforts to achieve energy efficiency; $5 billion for weatherization of low-income homes; $500 million for job training to help workers participate in the clean energy economy; and $300 million to purchase thousands of new, fuel-efficient vehicles for the federal fleet from American auto companies.

Beginning in his campaign for the presidency and continuing in his first 10 months in office, President Obama has demonstrated his commitment to a clean energy economy. He has supported legislation to reduce greenhouse gas emissions by at least 80 percent by 2050; advocated a national energy portfolio that requires 25 percent of the U.S. energy supply to be derived from renewable sources by 2025; and advocated a proposal that would increase the amount of energy derived from low- or zero-carbon sources, including renewable sources.

The fact that both the U.S. and South Korea have committed themselves to addressing environmental issues and pursuing a "clean energy economy" for the future offer great opportunities for collaborations and exchange of ideas. Research universities, the private sector, and government policymakers of both nations should explore ways of deepening their partnerships, exchanging ideas, and exploring new avenues for collaboration and trade as both nations pursue the means of creating the 21st century clean energy economy in their respective nations as well as around the world.

INTRODUCTION

Energy is the lifeblood of every human society. It helps humans control and adapt to their environments. The management of energy is critical for all societies. For the industrialized world, the development of effective energy resources are essential to agriculture, transportation, waste collection, information technology, communications, and others aspects of what are key characteristics of a developed society. In contemporary society, energy refers to a wide variety of sources, such as petroleum, coal, water, electricity, wind, solar, nuclear, and others.

The increased use of energy since the Industrial Revolution of the late 19th century has introduced numerous problems and challenges for the modern world. Increased use of coal and the production and consumption of petroleum-based fuels have added to pollution in the environment. Today, many scientists argue that these fuels are contributing to changes in the environment, including global warming or climate change.

Many modern societies, such as the United States, are highly dependent upon oil. The largest suppliers of that commodity are other nations in the Middle East, Asia, and South America, meaning that the U.S. is dependent upon those sources for its daily energy needs. The growing dependency on foreign oil combined with concerns about the impact of current energy sources on the environment and subsequently public health has led scientists, environmentalists, public health officials, policymakers, and governments around the world to begin exploring options to improve the efficiency and cleanliness of energy production for the future.

Sound energy policies are critical for any nation in today's world. In the case of the U.S., as its population and economy have grown, its need for energy, particularly oil, has increased exponentially. In most cases, that has led to greater dependency upon foreign sources of oil, which puts the nation at risk and holds the nation "hostage" to the whim of other nations. This was demonstrated in 1973 when members of the Organization of Petroleum Exporting Countries (OPEC) proclaimed an oil embargo in response to the US decision to re-supply the Israeli military during the Yom Kippur War; the embargo lasted until March 1974. The embargo led to a quadrupling in the price of oil to nearly $12 per barrel; the price of gasoline rose precipitously from 38 cents to 55 cents per gallon; and the New York Stock Exchange lost substantial value in a matter of weeks. The embargo had a negative effect on the US economy, causing immediate demands to address threats to US energy security. ["1973 oil embargo," http://en.wikipedia.org/wiki/1973_oil_crisis]

While the U.S. has not experienced a similar embargo in the ensuing decades, it has been subject to serious price fluctuations of oil on the world market. During the summer of 2008, oil reached $150 per barrel and the price of gasoline rose nearly 100%, exceeding $4.00 per gallon around the United States. These dramatic increases had a serious impact on the cost of energy for American industries. Many businesses adopted four-day work weeks; some provided small subsidies to help their workers survive the higher prices of gasoline. Millions of Americans, facing higher gasoline prices and airfares, decided to cut back on their summer vacations and stay closer to home, thus affecting the nation's tourist and entertainment industries.

Thus, the 1973 oil embargo and the oil crisis of 2008 clearly demonstrate the importance of having an energy policy that guarantees a nation's security and ensures that its people and economy are not beholden to one particular resource, especially one that is held in foreign hands. In addition, since people have become more aware of climate change and the impact of carbon-based energy sources on the environment, there have been increased calls for "energy independence" as well as the adoption of new "clean energy" technologies that will contribute to a cleaner, more livable environment.

This report therefore examines the current state of U.S. energy and energy policies. It explores (ever so briefly) the history of energy sources and policies in the U.S. It also gives special attention to the emergence of "clean energy" technologies. In so doing, the report highlights the Administration of President Barack Obama and its emphasis on a "clean energy" economy for the United States, and identifies what has been proposed and accomplished to date. The report includes, as a case study, what the State of Indiana is doing with regards to new energy technologies, including biofuels, wind energy, and high capacity batteries. Lastly, the report offers comments on the implications of the current and developing U.S. energy policies under President Obama for the Republic of Korea, possibly identifying specific opportunities for the two nations to cooperate and collaborate as they each pursue the development of a clean energy economy.

BRIEF HISTORY OF U.S. ENERGY – HOW DID WE GET TO WHERE WE ARE TODAY?

The energy needs of the early American colonies and the new American nation were met by the large amounts of standing timber, which was used for heating and industry. Whale blubber was rendered and served as a source of lamp oil. Innovations in technology and the subsequent rapid development of American industry during the Industrial Revolution of the late 19th and early 20th centuries launched the United States on the path towards a huge consumption of energy. It was during this time that the nation transitioned from timber- and coal-based energy sources to one based on coal and petroleum – sources that were indigenous to the United States.

Petroleum

In the 1840s, Samuel M. Kier found petroleum in his salt wells in Pennsylvania. He began to experiment with the crude oil and developed a substance called "rock oil." Further experimentation led to the refining the oil into kerosene "or carbon oil," which was used to fuel lamps. Kier established America's first oil refinery in Pittsburgh in 1853, expanding it to become the first commercial refinery to make illuminating oil from petroleum. ["Samuel Kier," http://en.wikipedia.org/wiki/Samuel_Kier]

In 1858, Seneca Oil, originally called the Pennsylvania Rock Oil Company, learned that there might be oil in Titusville, Pennsylvania. The company contracted with Edwin L. Drake, a former railroad conductor, to investigate suspected oil deposits in the area. He adapted the method of salt well drillers – using a steam engine to power the drill and to pipe into the bedrock below. Drake's discovery of oil in 1859 led to daily production of some 60 barrels a day, which launched the petroleum industry in the U.S. His discovery ignited an oil boom, which was fed by a growing demand for lighting fuel and lubricants.
["Edwin Drake," http://en.wikipedia.org/wiki/Edwin_Drake]

The first big oil discovery in the U.S. was on 10 January 1901 at Spindletop, an oil field in Beaumont in southeast Texas. It initially produced some 100,000 barrels per day from a depth of nearly 1,100 feet. At the time, it was one of the largest proven oil deposits in the world. It produced more than 17.5 million barrels of oil in 1902, but production decreased to approximately 10,000 barrels per day by February 1904. Over the decades, Spindletop continued to produce. With new technologies providing the ability to drill deeper, Spindletop fields had produced over 153 million barrels of oil by 1985. [*Handbook of Texas Online*, http://www.tshaonline.org/handbook/online/articles/SS/dos3.html]

Over the next four decades, the oil boom spread through Texas and California as the new American automobile industry took root. Since the early 20th century, the oil and auto industries have been inseparable from each other as well as from the entire American economy. Until the 1950s, the U.S. produced nearly all the petroleum it needed. By the end of the 1950s, the gap between production and consumption began to widen, attributed in part to the rapid expansion of the American economy and the growth in the number of automobiles. As a result, imported petroleum became an ever-growing component of the U.S. petroleum supply. ["History of Energy in the United States: 1635-2000 – Petroleum," Energy Information Administration, U.S. Department of Energy, http://www.eia.doe.gov/emeu/aer/eh/frame.html]

Electricity

Since its arrival during the latter third of the 19th century, electric power has radically transformed and expanded the use of energy in the United States.

While there had been experiments with electricity during the early 19th century, it was inventor Thomas Edison and his successful test of the light bulb in 1879 that led to continued improvements in lighting and power generating in the ensuing years. Within a year, Edison had founded the Edison Illuminating Company to construct electrical generating stations and distribute power to sections of New York City. The company became a prototype of other illuminating companies throughout the U.S.
["Thomas Edison," http://en.wikipedia.org/wiki/Thomas_Edison]

Electricity quickly became widespread as American industries like mining, steel, textiles, and printing electrified their facilities. Electricity contributed to the modernization of the nation's urban landscape as office buildings installed lighting, elevators, generators, fans, and pumps, and cities installed new electric streetlights and traffic signals. The availability of electricity also contributed to the growth of transportation and the development of electric streetcars and subways in the nation's largest cities. Electricity also penetrated the residential sector as American companies began to produce consumer goods like electric stoves, sewing machines, curling irons, vacuum cleaners, refrigerators, and other appliances to make daily life easier. Electricity also contributed to the emergence of the entertainment industry, including motion pictures, theaters, recording studios, and radio.

American cities received electric service first since it was cheaper, easier, and more profitable to supply large numbers of customers in close proximity. To assist development in the rural areas, President Franklin Roosevelt signed into law the Rural Electrification Administration (REA) in 1935, which loaned money and helped to set up electricity cooperatives. Though rural electrification was interrupted by World War II, the 1950s and 1960s saw tremendous advances. By 1967, more than 98 percent of American farms were using electricity from central station power plants.

The importance of electricity to America's economy and way of life is unquestionable. From 1949 to 2000, the nation's population increased 89 percent. During that same period, the amount of electricity use grew 1,315 percent. Per capita average consumption of electricity in 2000 was more than seven times the level of 1949, thus illustrating the explosion of electrically-powered items in households – appliances, household tools, air conditioning and heaters, communications, computers, and other devices.

Coal has been and continues to be the principal source of most electricity, accounting for over half of all electricity generated in the U.S. Hydroelectric power was an important source of power, accounting for nearly a third of the power generated in 1949; by 2000, that had decreased to about 7 percent. Natural gas and petroleum grew steadily as a source of electricity in the 1960s. ["History of Energy in the United States: Electricity," Energy Information Administration, http://www.eia.doe.gov/emeu/aer/eh/frame.html]

Natural Gas

Natural gas is primarily a mixture of methane, ethane, and propane. The first recorded effort to drill intentionally for natural gas in the United States occurred in 1821 in Fredonia, New York. For most of the 1800s, natural gas was used almost exclusively as fuel for lamps. The City of Philadelphia created the first municipally owned natural gas distribution company in 1836. Since no pipelines served individuals homes, most of the gas went to light city streets. But, with the introduction of electrical generating plants after the 1890s, many cities began to convert their street lamps to electricity. Gas producers then sought new residential markets for their product.

Two key developments in the ensuing decades contributed to the expansion of natural gas as an energy source. In 1885, German scientist Robert Bunsen invented a new burner that mixed air with natural gas, which demonstrated how gas could be used to provide heat for cooking and warming buildings. The second was the construction of pipelines to carry natural gas to new markets. Few were built before the 1940s, though one of the longest lines built was in 1891 – 120 miles long from the gas fields of central Indiana to Chicago. Subsequent searches for natural gas in the early 1900s turned up large reserves in Texas and Oklahoma. Following World War II, improvements in metal and welding technologies resulted in better pipes and stimulated the construction of thousands of miles of natural gas pipeline. The extent of the nation's pipeline network reportedly would stretch to the moon and back twice. [U.S. Department of Energy, http://fossil.energy.gov/education/energylessons/gas/gas_history.html]

Coal

Coal was a common fuel source for blacksmiths in the American colonies. England and Nova Scotia seemed to serve as the early sources of the "fossil coal" or "stone coal" until colonists began to find exposed beds on their farmlands. The first commercial coal production began in 1748 in mines around Richmond, Virginia. By the late 1700s, coal had been discovered near Pittsburgh where miners were extracting the material from steep hillsides.

By the 1800s, Americans were using more coal as they discovered larger quantities of the fuel beneath the land that they were settling and farming. In 1816, the city of Baltimore, Maryland, began to light its streets with combustible gas made from coal. In the 1830s, glassworks in Fayette County, Pennsylvania were using coal for their ovens. Coal also became the most popular fuel for boilers on steamboats and steam locomotives that plied the expanding nation's transportation network. It also was the principal source of fuel for the weapons factories that produced the cannon, guns, and ammunition used during the American Civil War.

By the 1870s, coke – a product of heating coal – replaced wood charcoal as the chief fuel for iron blast furnaces. Strip mining was becoming more prevalent. The steam shovel, developed c. 1839, became the principal machine that transformed the emerging coal industry, allowing workers to reach deep, thick coal beds. With the surge in iron and steel production during America's Industrial Revolution of the late 19th century, coal production increased nearly 300 percent.

The discovery of abundant supplies of coal contributed to the nation's early electric power generation. Edison built the first coal-fired electric generating station in 1882 to supply electricity to residents of New York City. The vast supplies of coal also led to its widespread use to heat homes, provide cooking heat, and fuel America's expanding industries.

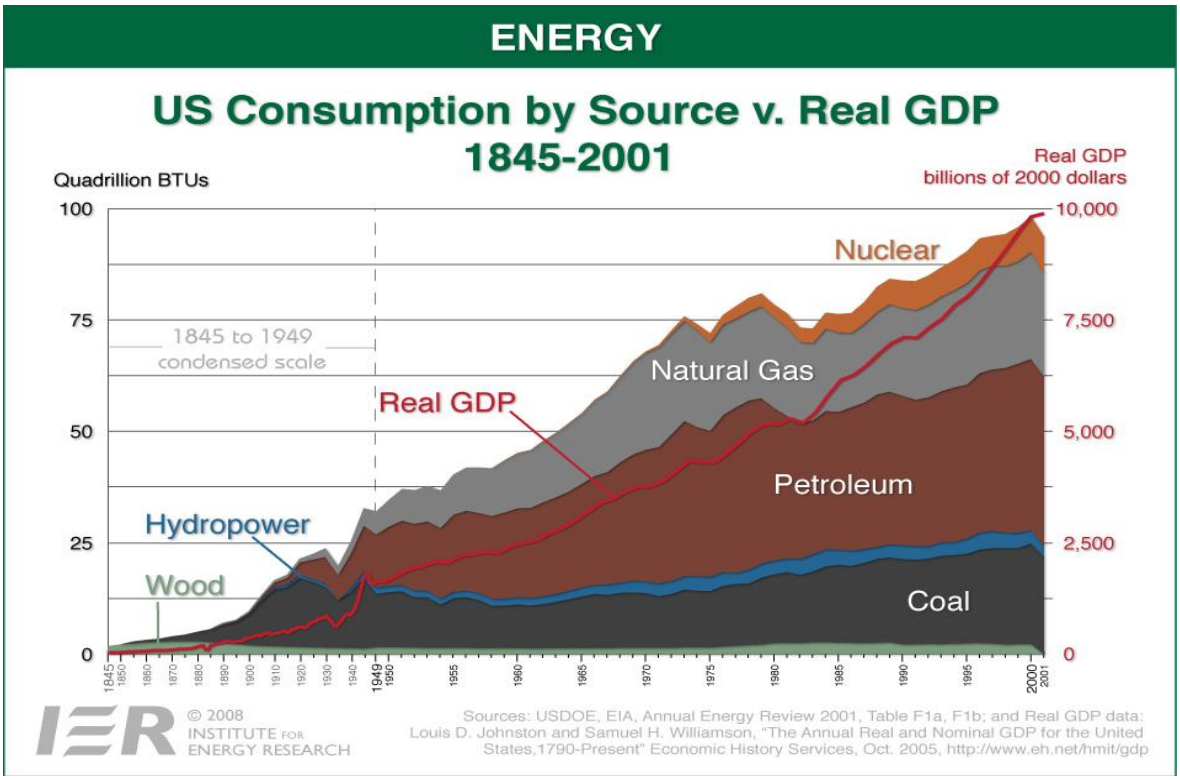
By 1961, coal had become the principal fuel source used by utilities to generate electricity. Since that time, coal production has grown substantially – from 520 million tons in 1970 to one billion tons in 1990 and more than 1.1 billion tons currently. ["History of U.S. Coal Use," U.S. Department of Energy, Office of Fossil Energy, http://www.netl.doe.gov/KeyIssues/historyofcoaluse.html]

Nuclear

Of all the major forms of energy now in use, nuclear power is the only one with modern roots. During the 1930s and 1940s, scientists conducted research on controlled fission of heavy elements to produce enormous energy. Research into the peaceful uses of nuclear materials began after the end of World War II under the direction of the Atomic Energy Commission, created by the Atomic Energy Act of 1946. The U.S. Navy took the lead since they saw an opportunity to develop ships capable of traveling great distances at higher speeds.

From the naval reactors program, researchers began to explore the use of reactor steam to drive turbines turning generators. In May 1958, President Dwight Eisenhower opened the Shippingport Atomic Power Plant in Beaver County, Pennsylvania, as part of his "Atoms for Peace" program. The facility was the first commercial nuclear power plant in the U.S.

The growing awareness of U.S. dependency on imported crude oil led to a wave of enthusiasm for nuclear electric power in the late 1960s and early 1970s. The Atomic Energy Commission envisioned more than 1000 reactors would be operating in the U.S. by the year 2000. However, a variety of accidents at nuclear power plants around the world, particularly Three Mile Island in Pennsylvania (1979) and Chernobyl in Ukraine (1986), worries over radiation emissions, and the ability to handle nuclear waste raised public concerns about the future of nuclear power. ["Nuclear power in the United States," http://en.wikipedia.org/wiki/Nuclear_power_in_the_United_States]

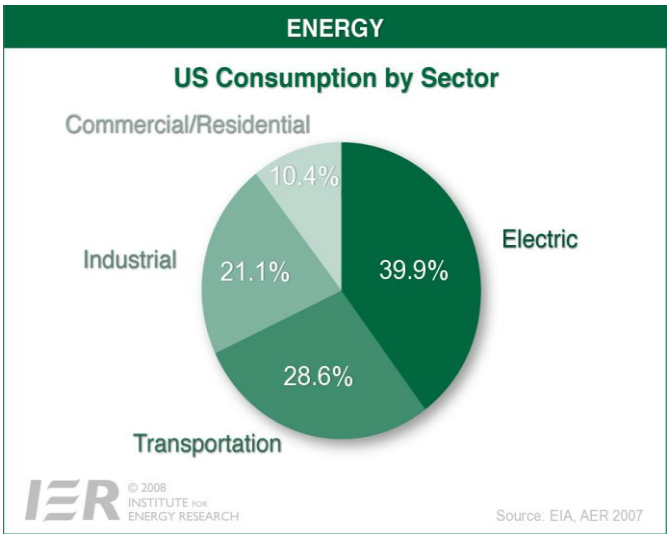


[Source: Institute for Energy Research]

U.S. ENERGY TODAY - OVERVIEW

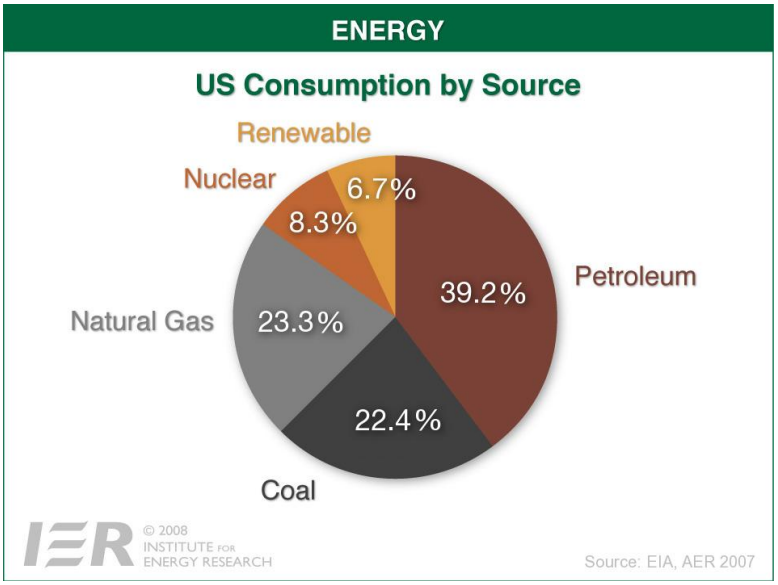
In the 21st century, the United States consumes energy from a variety of sources for a vast set of purposes. To maintain the world's largest economy, the nation's energy choices have changed from solely wood and coal to new energy resources and technologies used for heavy industry, manufacturing, transportation and communication, which create a diverse energy portfolio.

Electricity is the leading form of energy consumption in the United States. This is clearly evidenced by the appliances, computers, televisions, heating and cooling systems, lighting, and other devices found in American homes and businesses that make life easier, more efficient, and more enjoyable. **Transportation** is the next most popular consumer of energy. While this category includes personal travel, much of the energy consumed involves moving products of the nation's economy to market via planes, trains, and ships. **Industrial output** is responsible for the third largest amount of energy consumption. Lastly, approximately 10 percent of energy is consumed by **American homes and business buildings**.



[Source: Institute for Energy Research]

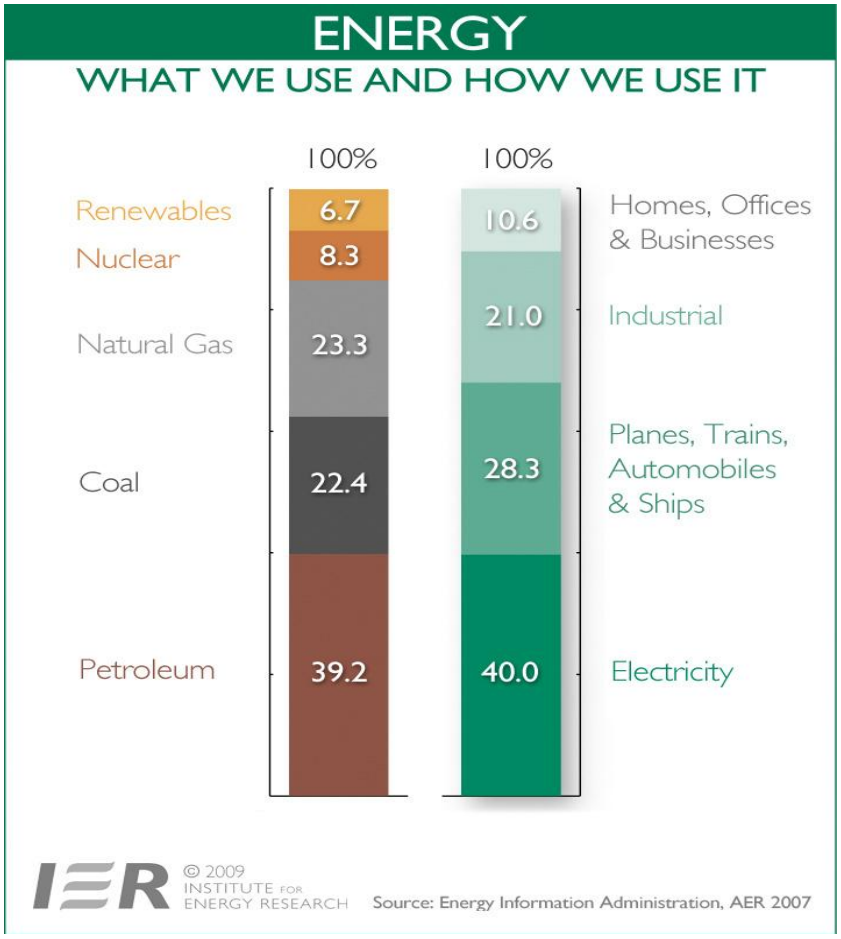
Since the early 20th century, America's demand for energy has grown significantly. To meet the growing appetite for energy, America began to diversify its energy sources beyond fossil fuels. Hydroelectric power, a source of energy created by erecting dams on rivers, was introduced in the 1890s and became increasingly popular in the 20th century with the construction of such facilities as Hoover Dam in Nevada and Arizona (1936), Grand Coulee Dam in Washington State (1942), and the Chickamauga Dam in Tennessee (1940). Commercial nuclear power became available in the late 1950s with the opening of the Shippenport plant in Pennsylvania in 1958. Within the past few decades, renewable sources of energy, such as wind, solar, biomass, and geothermal, has become increasingly popular. Once a topic of great interest during the 1970s oil embargo, renewable sources have become the focus of clean energy advocates and those seeking "energy independence" for the U.S. for the 21st century.



[Source: Institute for Energy Research]

New sources of energy have surfaced in recent years as a result of extensive research into new clean, efficient technologies. High capacity batteries are now being used to power automobiles and light vehicles. Some public transportation systems and companies have introduced natural gas-powered vehicles to their fleet. Fuel cells, which convert pure hydrogen into power, also have garnered much attention in recent years. Honda is presently leading the way in developing this fuel source for use in automobiles with the production of the FCX Clarity in 2009. The company has proposed assembling hydrogen-powered cars in a recently opened assembly plant in Greensburg, Indiana.

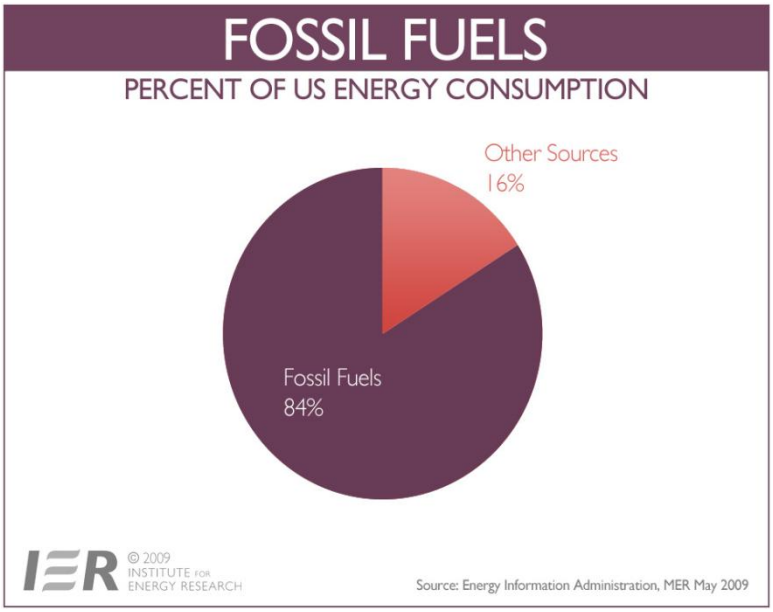
A renewed interest in alternative and particularly renewable sources of energy has been stimulated by the high energy prices (especially oil) in the past few years as well as growing concerns about climate change, global warming, and carbon footprints. These influences, along with the strong emphasis on energy research in the Obama Administration, will certainly stimulate research and development of new technologies for the future. Stimulated by the demands of the present and future, creative minds will certainly continue to search for new sources of energy to meet the needs of future society as well as to bring new sources of energy to the growing population of people around the world who lack the basics to meet their daily energy needs.



[Source: Institute for Energy Research]

Fossil Fuels

Fossil fuels, which include coal, petroleum (oil), and natural gas, are considered non-renewable sources of energy. They are concentrated organic compounds found in the Earth's crust, created from the remains of plants and animals that lived millions of years ago. According to the U.S Energy Information Administration (EIA), fossil fuels constitute about 84 percent of energy consumption today.



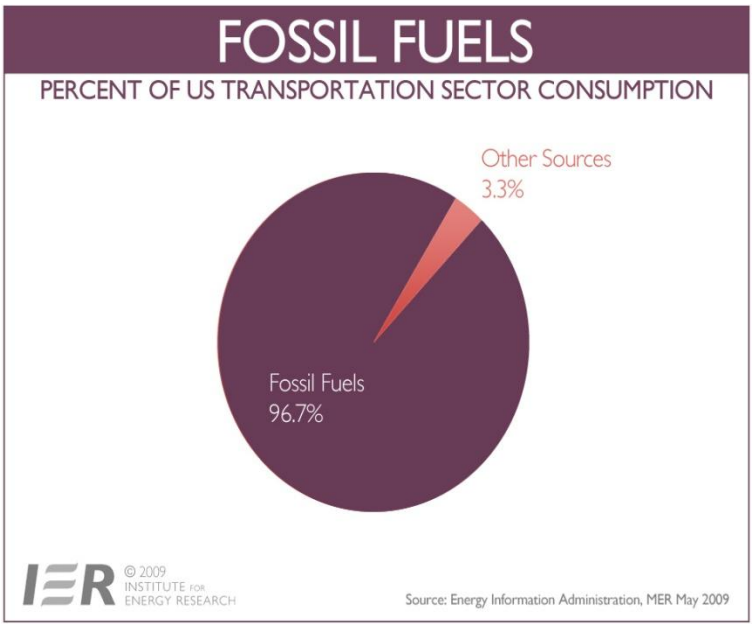
[Source: Institute for Energy Research]

Fossil fuels have become synonymous with modern American industrial society. Over the course of American history, coal and oil quickly displaced the use of low-energy firewood to fuel the Industrial Revolution of the late 19th century and expansion and diversification of industry throughout the 20th century. Within a few decades, the U.S. moved from an importer of coal (primarily from Britain) to a major exporter as the nation's significant reserves were mined. In the mid 19th century, Edwin Drake's successful drilling of oil in northwestern Pennsylvania introduced a new source of energy that would fuel industrial expansion and contribute to the automobile industry of the 20th century.

The U.S. Energy Information Administration (EIA) has credited fossil fuels for bringing about "one of the most profound social transformations in history." With the introduction of these fuels, American society, along with those of Europe and Japan in the mid 20th century and others more recently, quickly was transformed from an agrarian society to a booming complex industrial society.

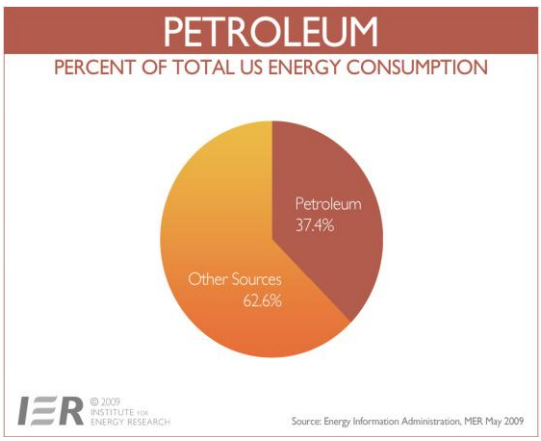
Oil is the fuel source that has probably had the most profound impact on the U.S. and the world as a whole. Oil is commonly known as the "transportation fuel" that allows modern societies to power its modes of transportation, moving people and goods around their communities and across the globe. Like coal's contribution to the Industrial Revolution in the late 19th century, oil

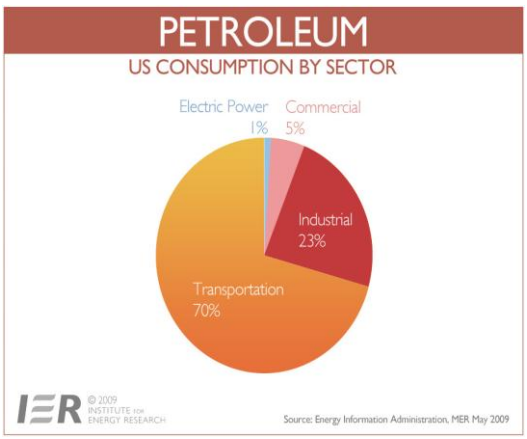
has been the world's leading source of energy since the mid 1950s, contributing mostly to the advancement of the automotive industry in the U.S. and around the world.



[Source: Institute for Energy Research]

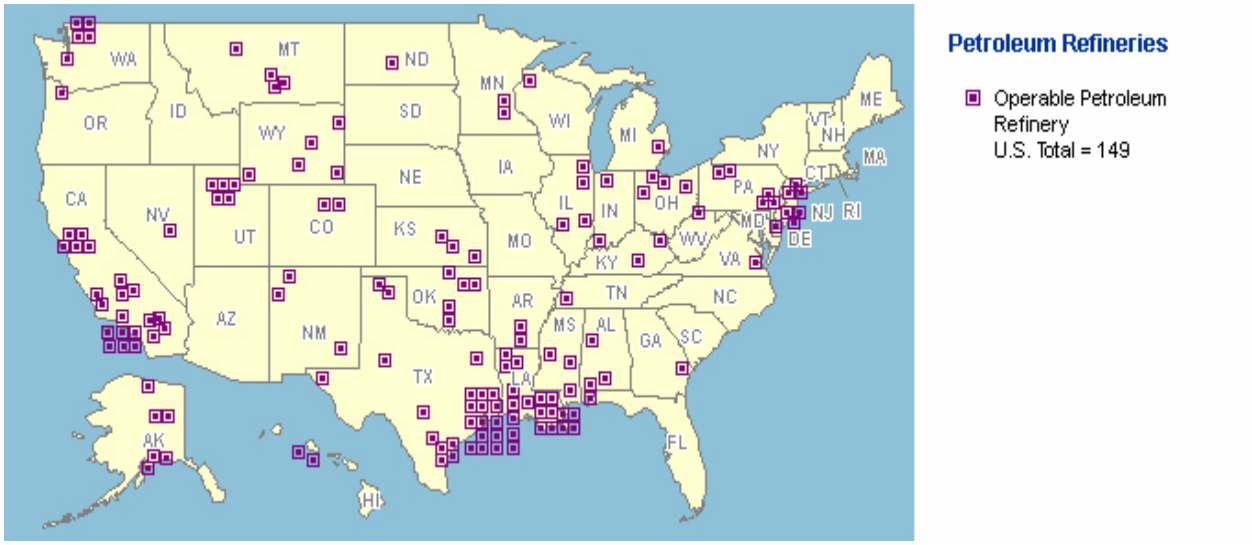
The Energy Information Administration (EIA) reports that oil meets 37 percent of the nation's energy demand; 70 percent of that is dedicated to fuel used for transportation, such as gasoline, diesel and jet fuel. American industries and manufactories use another 24 percent; 5 percent is used in the commercial and residential sectors; less than 2 percent is used to generate electricity. [EIA, http://www.eia.doe.gov/emeu/mer/pdf/pages/sec1_7.pdf.; http://www.eia.doe.gov/emeu/mer/petro.html.]





[Source: Institute for Energy Research]

The EIA estimates that U.S. proven oil reserves to be about 21 billion barrels. Texas and Alaska each account for a significant share of U.S. crude oil production. Texas's 26 refineries process nearly 4.8 million barrels of crude oil per day, accounting for more than 25 percent of the total U.S. refining capacity. The Alaska North Slope contains 14 of the 100 largest oil fields in the U.S. Other states, in order of volume, include California, Louisiana, and Oklahoma. The federal offshore areas in the Gulf of Mexico and California produce approximately 25 percent of the U.S. total, which surpasses any single state. [For state energy profiles, see: Energy Information Administration, http://tonto.eia.doe.gov/state/]



[Source: Energy Information Administration, http://tonto.eia.doe.gov/state/]

The most common products derived from oil are found in the energy sector: gasoline, heating oil, aviation fuels and diesel fuel. Oil, however, is also a key ingredient in tens of thousands of consumer goods, including plastics, tires, deodorants, dishwashing liquids, among other products. According to the Energy Information Administration, a 42-gallon barrel of oil yields the following refined products (percent of barrel):

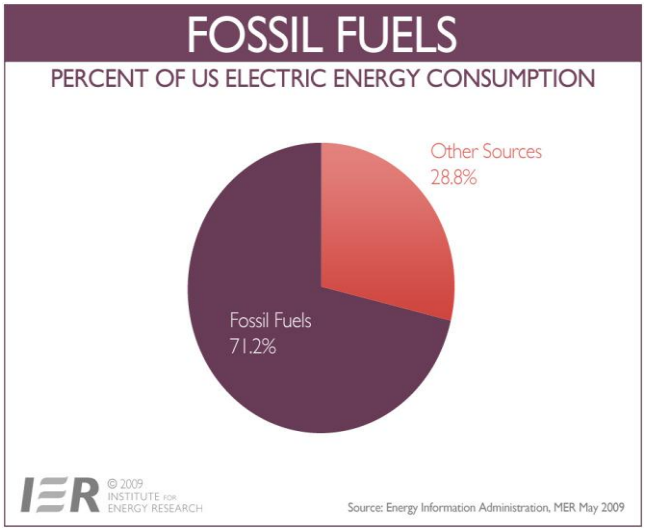
- **44.2%** gasoline for use in automobiles
- **27.8%** heating oil and diesel fuels
- **22.2%** other products
- **9.6%** jet fuel
- **2.7%** asphalt

[Note: There is a processing gain of over 5 percent per barrel, meaning that a 42-gallon barrel of crude actually yields 44.68 gallons of refined product. Energy Information Administration, http://www.eia.doe.gov/kids/energyfacts/sources/non-renewable/oil.html#How%20used]

In the mid 20th century, the U.S. relied upon its own production of oil. By the 1970s, the nation was becoming increasingly dependent upon foreign sources of crude. Production of petroleum in the U.S. hit its height in 1970 at 9.4 million barrels per day. [Katrina Arabe, "How Oil Refining Transformed U.S. History & Way of Life," *Industrial Market Trends*, 17 January 2003 -- http://news.thomasnet.com/IMT/archives/2003/01/how_oil_refinin.html]

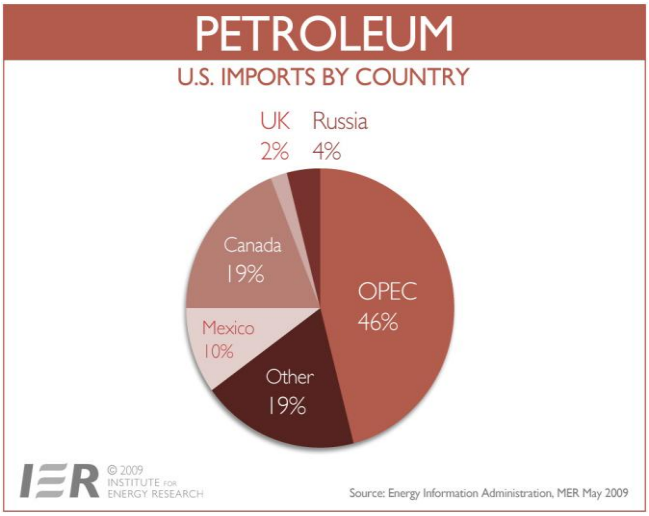
But, as the production of energy became a growing concern, President Richard Nixon delivered in April 1973 the first-ever presidential address on the topic of energy. He announced his decision to abolish the quota system, which had capped the import of crude oil to the U.S. Without the barriers, the U.S. became a truly dependent member of the oil-consuming market. Within a matter of months, American imports of petroleum had doubled. ["Petroleum History, United States," *The Encyclopedia of Earth* -- http://www.eoearth.org/article/Petroleum_history,_United_States] By 2008, 57 percent of the oil consumed in the U.S. was imported from foreign countries. [Energy Information Administration, Monthly Energy Review, May 2009]

Even though global demand for petroleum products continues to expand, EIA estimates that less than half the world's conventional oil reserves will be exhausted by 2025. World oil reserves as of 1 January 2009, totaled 1342.2 billion barrels [EIA, International Energy Outlook 2009, Table 4] It is generally believed that the discovery of new reserves, opening of known but previously untapped reserves, and the development of new technologies to remove all petroleum from existing wells will add to the world's reserves even while demand increases. [Institute for Energy Research, "Has Oil Reached Its Peak," http://www.instituteforenergyresearch.org/2008/08/26/has-oil-reached-its-peak/]



[Source: Institute for Energy Research]

Despite the calls to become "energy independent," the U.S. has become increasingly dependent upon foreign oil to meet its growing energy needs. Nearly half of the oil comes from OPEC nations; other major sources include Canada (19 percent), the Persian Gulf (18 percent), and Mexico (10 percent). [EIA, "U.S. Imports by Country of Origin," http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbblpd_a.htm]



[Source: Institute for Energy Research]

Given the rich petroleum reserves in the U.S., why did the U.S. become increasingly dependent upon foreign sources? It can be attributed, in part, to an active environmental movement and federal government restrictions on oil and natural gas drilling to protect the coastlines due to environmental concerns. In 1982, during the administration of President Ronald Reagan, Congress directed that no federal funds could be used to lease federal tracts off the coasts of Washington, Oregon, or central and northern California. Over the ensuing years, Congress added other areas so that most of the east and west coasts, as well as the eastern portion of the Gulf of Mexico, are off limit to drilling. Specific actions to limit offshore drilling include:

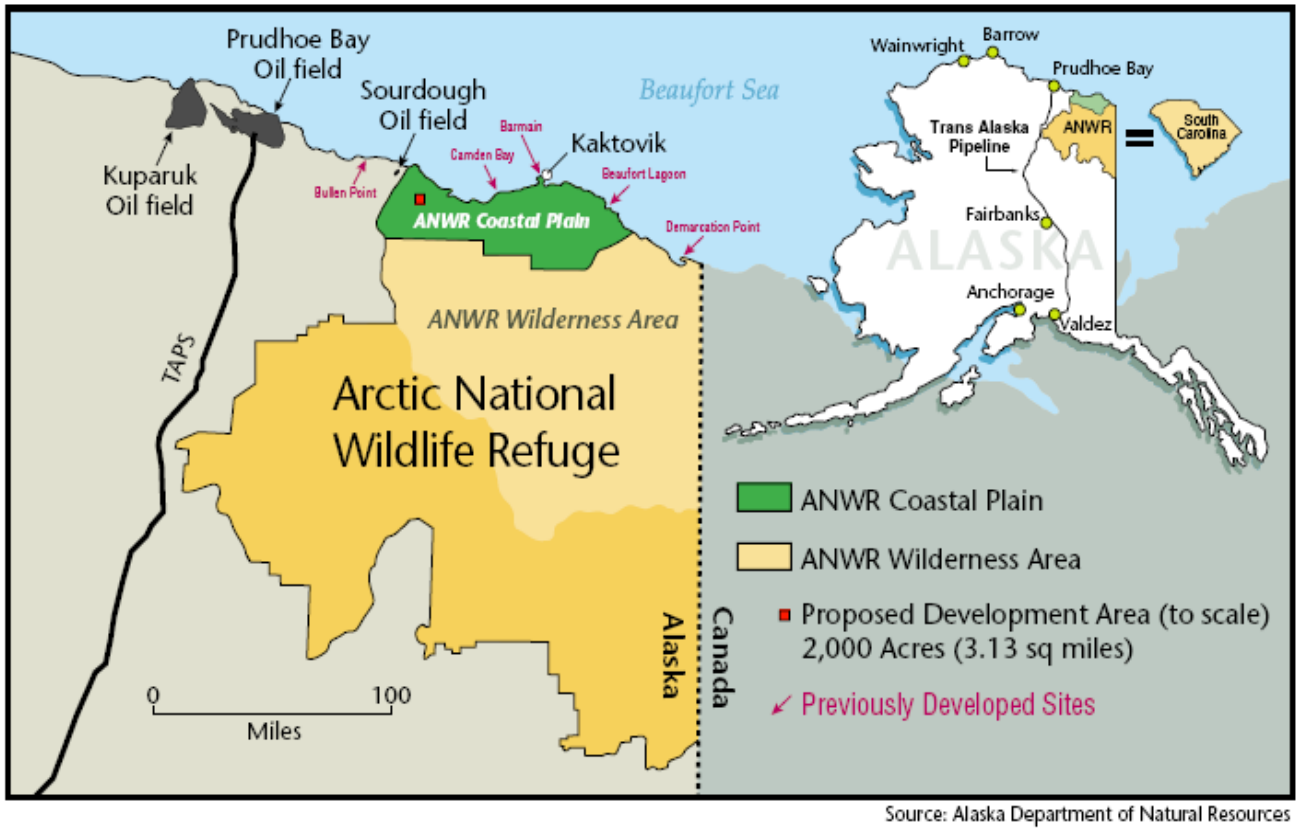
- 1990 – Congress passed the North Carolina Outer Banks Protection Act, which prohibits leasing and drilling on federal seabed offshore from North Carolina.
- 1990 – President George H.W. Bush issued an executive moratorium restricting federal offshore leasing to Texas, Louisiana, Mississippi, Alabama, and parts of Alaska. The moratorium banned federal leasing through the year 2000.
- 1998 -- President Bill Clinton extended the moratorium through 2012.
- 2002 – Congress imposed a moratorium on drilling on or directionally beneath the Great Lakes.
- 2008 – President George W. Bush rescinded the executive order regarding offshore drilling for the east and west coasts.

[Source: "Offshore oil and gas in the United States," http://en.wikipedia.org/wiki/Offshore_oil_and_gas_in_the_United_States]

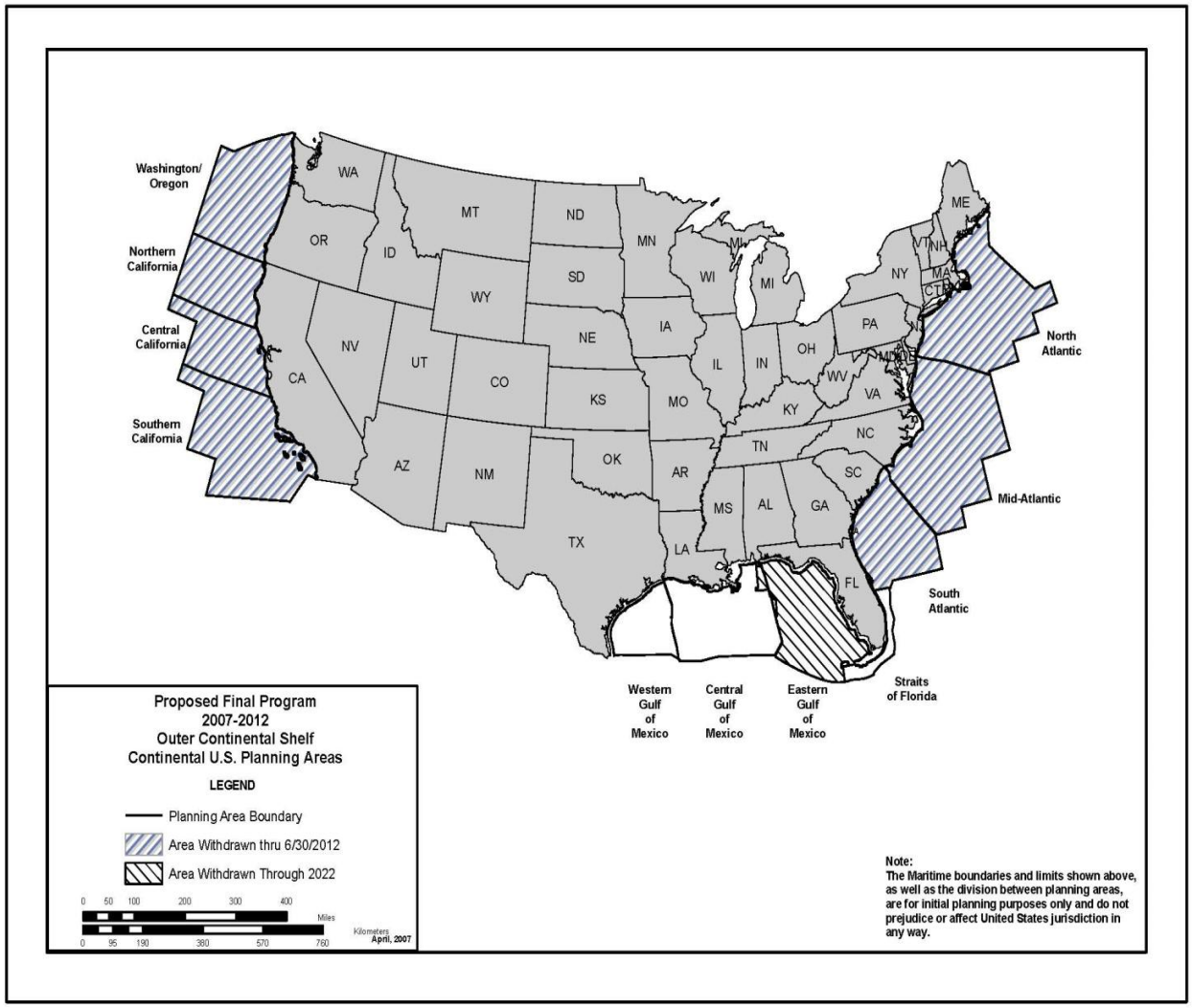
Several states, including California and Florida, have banned leasing of state waters for oil and gas drilling, primarily due to environmental concerns and the potential impact on their tourist economies. In 2009 a bill that would have partially rescinded a ban on oil and gas leasing of Florida's waters failed in the Florida statehouse. Likewise, states surrounding the Great Lakes have generally fought against efforts to drill on or directionally beneath those lakes since they constitute the largest body of fresh water lakes in the world.

The U.S. Congress allowed the moratoria to most of the offshore areas to expire on 30 September 2008, providing an estimated resource of 18 billion barrels of additional crude oil. This estimate is considered extremely conservative by most petroleum experts because, historically, oil discoveries are not made until one is allowed to look. The issue, however, is far from over since some members of Congress would like to restate the moratoria, since leasing is often tied up in lengthy litigation. However, in order to secure adequate public input on any changes in offshore drilling, the Obama Administration has extended the comment period put in place by the Bush Administration for leasing new offshore areas.

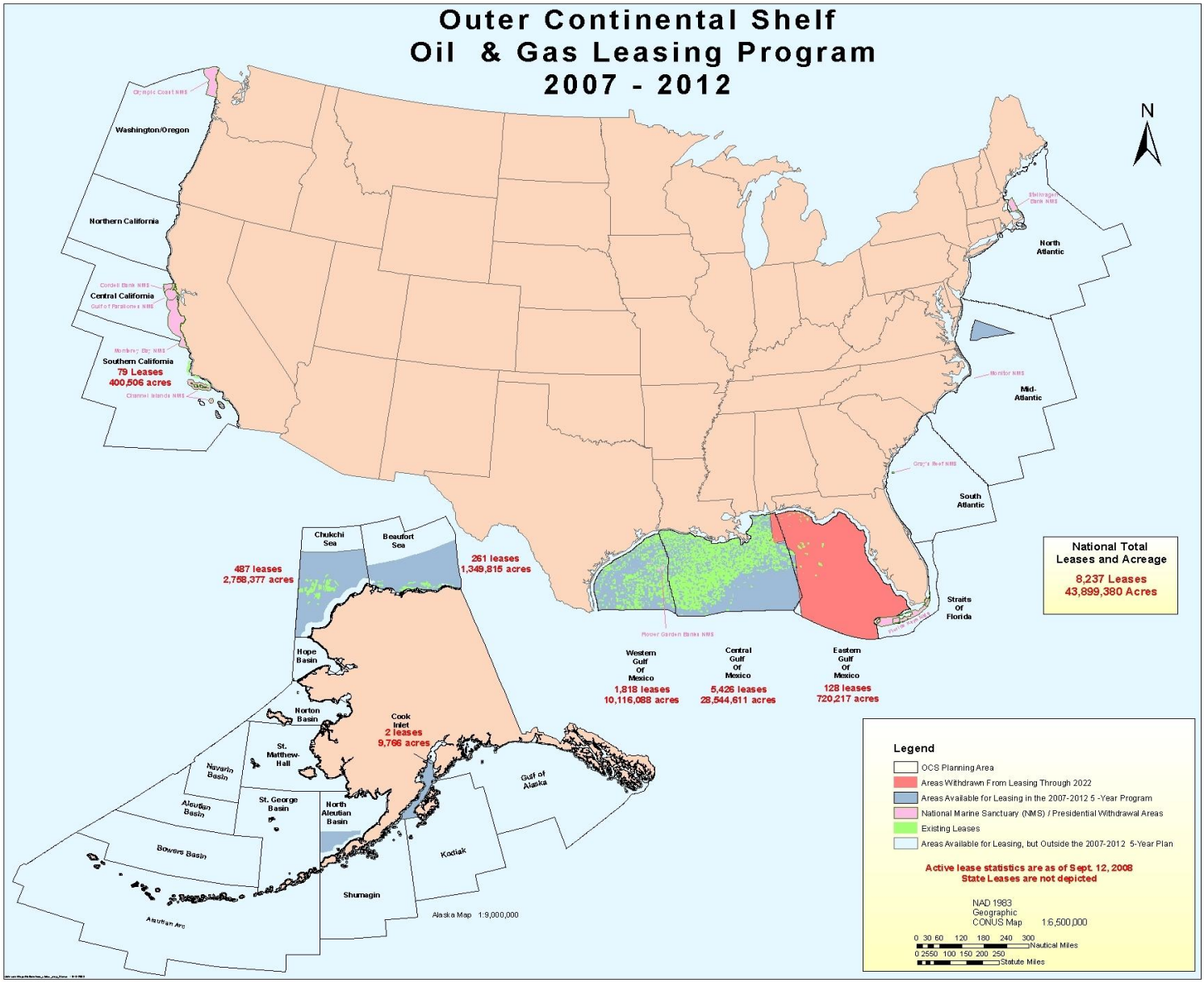
Another matter of concern pertains to the reserves located in the Arctic National Wildlife Refuge. This refuge consists of 19.2 million acres (or 78,049 km^2) in the Alaska North Slope region and is the largest National Wildlife Refuge in the U.S. The question of whether to drill for oil here has been an issue of ongoing debate since the late 1970s. At issue is whether to drill for oil in a specific area of the ANWR Coastal Plain – containing an estimated 10.4 billion barrels--, whether the cost is feasible to secure recoverable oil, and whether further oil exploration might have a negative impact on the wildlife and the environment as a whole. It is estimated that some 7.7 billion barrels of oil lie under the ANWR Coastal Plain.



Source: Alaska Department of Natural Resources



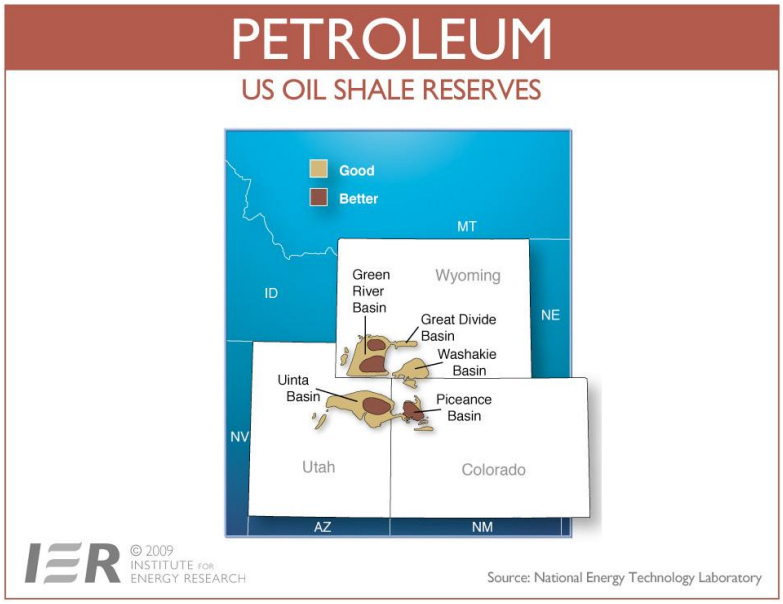
[Source: U.S. Minerals Management Service, http://www.mms.gov/5-year/assets/Maps/National_withdrawn(grey).pdf]



[Source: US Minerals Management Service, http://www.mms.gov/ld/PDFs/OCSstatusMap8e(3).pdf

Given concerns about the U.S.' ability to achieve "energy independence," many energy experts conclude that the U.S. remains rich in petroleum potential and should pursue those offshore options. There are numerous known reserves, but many of those remain off limits due to federal and/or state regulations. There are also certain sources in deep water that may be too expensive to produce. Since 2004, however, Chevron and BP have made several discoveries off the coast of Africa and in the Gulf of Mexico at depths of some 3,600 meters (or 11,800 feet). Deep drilling is a costly enterprise due to the state-of-the-art technology to reach those depths. Energy experts believe that producing oil from ultra-deep wells may be profitable so long as oil sells at or above $45 per barrel.

Oil Shale is another potential energy resource for the U.S. This is a sedimentary rock, found in large deposits in Colorado, Utah, New Mexico, and Wyoming, that contains an organic sedimentary material called "kerogen." The shale is heated in order to separate the kerogen from the rock. The resulting liquid can be converted to high quality jet fuel, diesel fuel, kerosene, and other products.



According to the Energy Information Administration and the Institute for Energy Research, U.S. oil shale resources may contain the equivalent of 2 trillion barrels of oil. ["Development of America's Strategic Unconventional Fuels Resources, Task Force on Strategic Unconventional Fuels, September 2006," http://www.fossil.energy.gov/programs/reserves/npr/publications/sec369h_report_epact.pdf]

Studies by the Institute for Energy Research conclude that the world has used 1 trillion barrels of oil since the first well was drilled in Pennsylvania in 1859. Given the estimated oil shale reserves, the appropriate technology could produce as much as 800 billion barrels of oil from the shale (approximately 25 gallons per ton) or approximately three times the amount of proven oil reserves in Saudi Arabia. If that is indeed the case, processing oil shale could be a major step forward for the U.S. in reaching its goal of "energy independence" in the coming decades. [http://www.fossil.energy.gov/programs/reserves/npr/publications/sec369h_report_epact.pdf]

There are some new technologies that may allow greater access to the oil shale deposits. In the State of Colorado, Shell is abandoning old mining techniques that failed in the past and adopting a process that heats the shale underground. Called **in-situ conversion process (ICP),** the technique uses subsurface heaters to slowly heat the shale rock to 650 – 750 degrees Fahrenheit. Once heated, the kerogen oil and gas are released from the shale and brought to the surface with traditional pumps. An advantage to the in-situ process is it significantly reduces (and in some cases eliminates) the environmental impacts from previous shale oil recovery methods. Some of the key advantages to this method include:

- The process involves no open-pit or subsurface mining.
- It does not produce thousands of tons of shale waste as traditional mining methods do.
- It avoids groundwater contaminants via a "freeze wall" placed between the oil shale and water sources.
- It minimizes water use and unwanted byproducts.

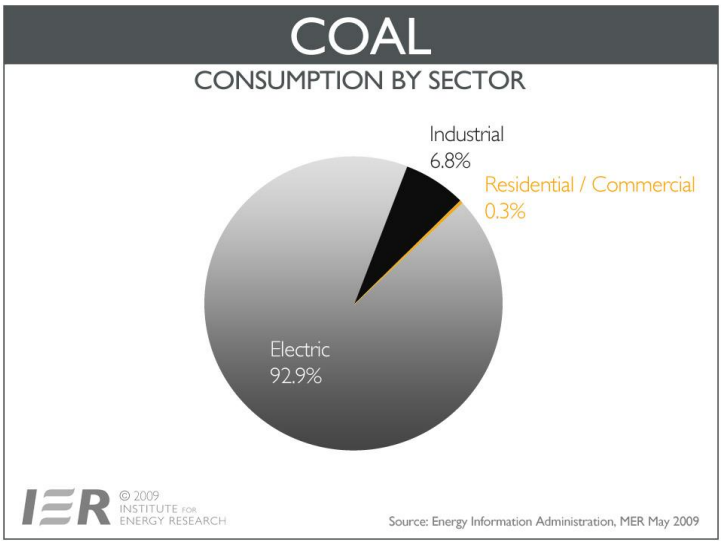
As is common with new manufacturing processes, operating costs can be expected to decrease over time, as experience leads to design enhancements and improved efficiency. Due to encouraging trial results in 2005, Shell is dramatically expanding its efforts with a more expansive research effort scheduled to run until 2010.

Sources: Fact Sheet: Fact Sheet: U.S. Oil Shale Resources, DOE Office of Petroleum Reserves Strategic Unconventional Fuels, -- http://www.fossil.energy.gov/programs/reserves/npr/Oil_Shale_Resource_Fact_Sheet.pdf

"Is oil shale America's answer to peak oil challenge?" *Oil and Gas Journal*, August 9, 2004, http://www.fossil.energy.gov/programs/reserves/publications/Pubs-NPR/40010-__373.pdf

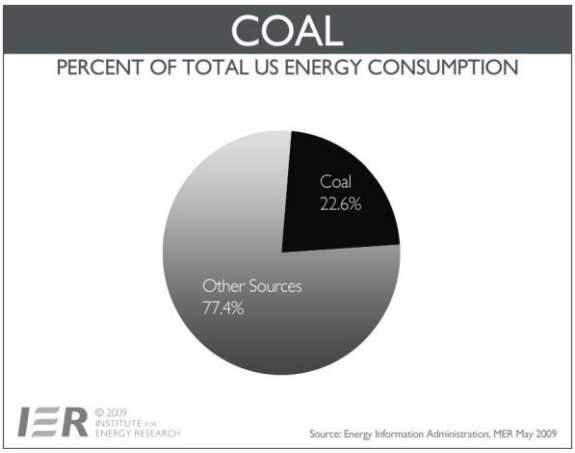
Oil Shale, Colorado School of Mines, http://www.mines.edu/outreach/cont_ed/emfi/emfi2005/OilShale.pdf

Coal is the most abundant fossil fuel produced in the U.S. Over 90 percent of the coal consumed in the U.S. today is used to generate electricity compared to just 19 percent in 1950.



[Source: Institute for Energy Research]

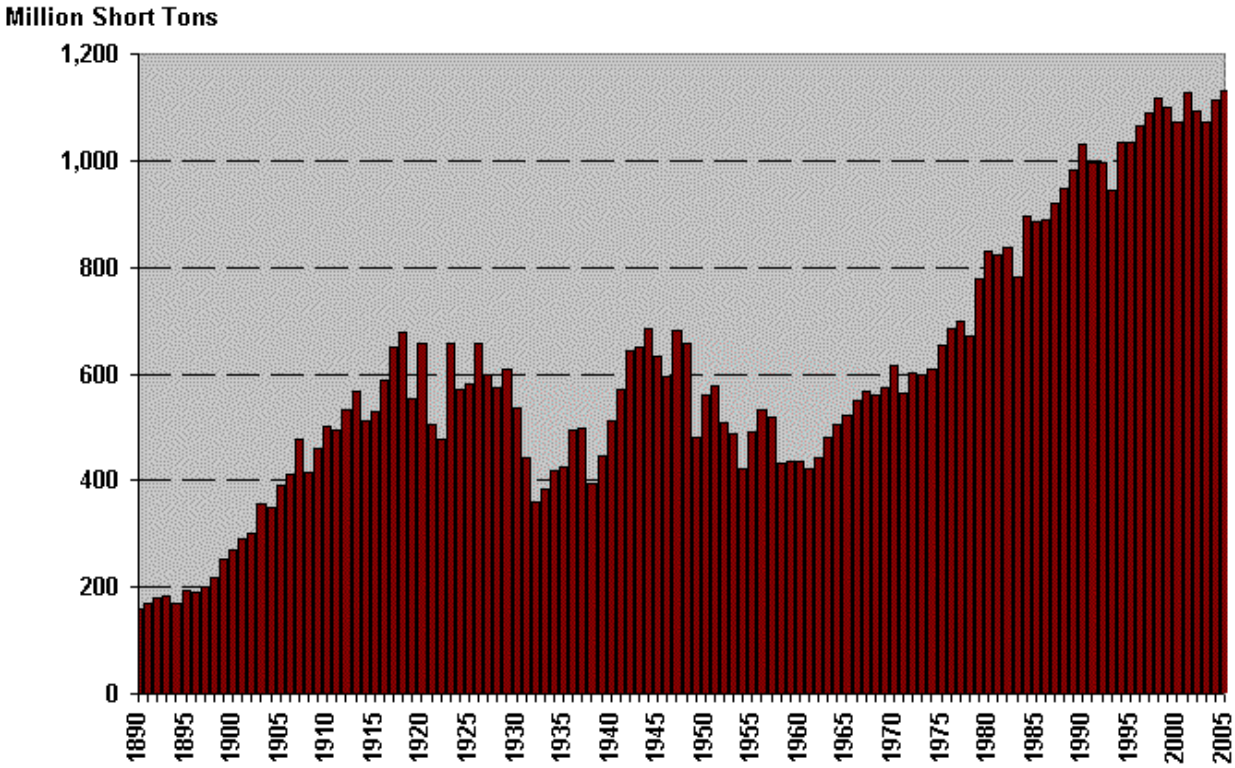
Coal has been the one consistent energy source of the U.S. since its founding. It was the first fossil fuel to impact energy production and consumption in modern times and it remains a major contributor to the world's energy supply today. It was initially confined to use in chimneys to generate heat or smiths' forges to heat and shape iron. Coal then became the chief transportation energy source, feeding the railroads and steamships that built the American economy. It then fed the Industrial Revolution and supplied industrial and transportation fuel during the World Wars. The use of coal for rail and water transportation and heating declined in mid 20th century, but coal demand continued to grow as it became the principal source for fueling electricity generating plants. Today, coal is used to meet 23 percent of the nation's total energy demand and it generates about half of all electricity.



[Source: Institute for Energy Research]

The Oil Embargo of 1973 renewed interest in America's coal reserves as "energy independence" became a concern for policymakers. Coal production surged as a result, increasing some 14.4 percent between 1973 and 1976. In 1978, Congress passed the Power Plant and Industrial Fuel Act, which mandated the conversion of most existing oil-burning power plants to coal or natural gas. This, along with new technologies on coal liquefaction and gasification, was aimed to wean the U.S. from imported oil supplies and to promote domestic energy production. These noble projects lost favor when crude oil prices fell in subsequent years, making these new technologies less cost effective.
["Coal Production in the United States – An Historical Overview," Energy Information Administration, http://www.eia.doe.gov/cneaf/coal/page/coal_production_review.pdf]

U.S. Coal Production, 1890-2005



Sources: Annual Coal Report, (and predecessor report titles), DOE/EIA-0584 (years 1993-2003) and DOE/EIA-0118 (years 1976-1992); Energy Information Administration: Washington, DC. In-house file data from U.S. Bureau of Mines, Annual Coal Production surveys by Bureau of Mines and by U.S. Geological Survey (years 1890-1975): Washington, DC.

Originally published in "Coal Production in the United States – An Historical Overview," Energy Information Administration, U.S. Department of Energy.
http://www.eia.doe.gov/cneaf/coal/page/coal_production_review.pdf

American coal production is currently the second highest in the world, behind China, delivering some 1.17 billion short tons in 2008. [EIA, Monthly Energy Review, May 2009]. The U.S. also has vast coal resources – estimated over 10 trillion short tons. The U.S. coal industry uses a variety of mining techniques – underground, surface, strip, mountaintop removal, among others – and then transports the coal to over 500 power plants in the U.S.

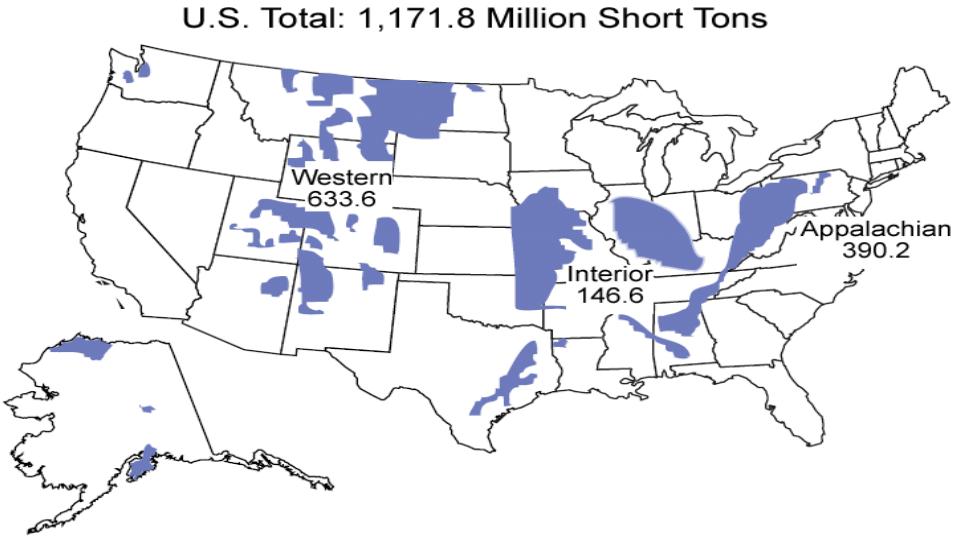
According to the Energy Information Administration, the U.S. has enough recoverable coal reserves to last another 200-250 years. These reserves, which constitute some 28 percent of the entire world's coal supply, are approximately one-and-one-half times greater than Russia and over twice that of China. Combined, all U.S. coal resources may contain the energy equivalence of 35 trillion barrels of oil, thus indicating the future promise of utilizing America's coal reserves to meet part of its growing energy needs. [EIA, International Energy Outlook 2009, Table 9 -- http://www.eia.doe.gov/oiaf/ieo/pdf/0484(2009).pdf .]

Even as coal has become recognized as a viable energy source for the U.S., there have been efforts to control the amount and type of coal that is used. Starting in the 1970s the government adopted more stringent restrictions on atmospheric emissions of sulfur dioxide at power plants, which contributed to the boom in the mining of low-sulfur coal in the American West. In recent years, there has been extensive work on "clean coal technology" that is intended to "wash" the impurities from coal and "capture and store" carbon emissions.

Coal can also be converted into liquid fuels – gasoline, diesel, and jet fuel – as well as into an alternative to liquid natural gas (LNG) through different processes. One of the concerns regarding this process is that coal liquefaction involves carbon dioxide (CO_2) emissions in the conversion process. If this process is pursued, there would need to be a form of carbon sequestration or long-term storage to prevent the release of carbon dioxide into the atmosphere. ["Carbon sequestration," http://en.wikipedia.org/wiki/Carbon_dioxide_sequestration]

If the U.S. decides that its coal reserves will assist the nation in gaining "energy independence," then new methods to utilize coal in newer and cleaner forms will need to be discovered and implemented.

Coal Production by Coal-Producing Region, 2008 (Million Short Tons)



Note: Regional totals do not include refuse recovery.

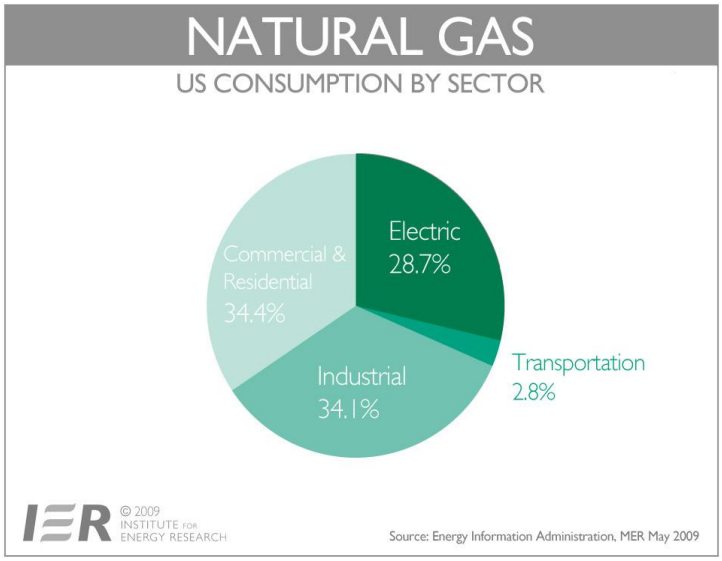
Source: Energy Information Administration, *Annual Coal Report 2008*, Figure ES1 and Table 1 (September 2009).

Natural Gas, a colorless, odorless gas prized for its cleanliness, is the last of the fossil fuels to have been adapted as a source of energy. Introduced in the late 19th century as a source of lighting streets and homes, natural gas did not emerge as a significant source of energy until the development of steel pipeline and appropriate safety equipment to allow the gas to be transported

safely to market. One of the first lines was constructed in 1891, spanning 120 miles between central Indiana and the City of Chicago. The first all-welded pipeline, some 200 miles in length, was built from Louisiana to Texas in 1925. ["History of Natural Gas," NaturalGas.org -- http://www.naturalgas.org/overview/history.asp]

According to the Institute for Energy Research, the demand for natural gas grew 50-fold between 1906 and 1970. The U.S. remained self-sufficient until the 1990s when the U.S. began importing natural gas, mostly from neighboring Canada, to meet the growing demand.

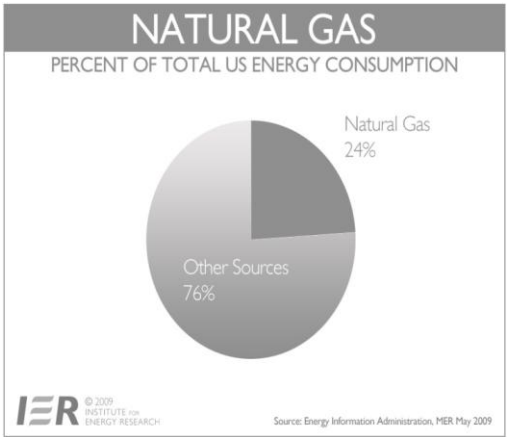
Today, the U.S. is the second-largest producer of natural gas, behind Russia, producing some 20.6 trillion cubic feet in 2008. [EIA, http://www.eia.doe.gov/emeu/mer/pdf/pages/sec4_3.pdf] The U.S. consumed 21 percent of all natural gas produced worldwide in 2007. The EIA reported that U.S. natural gas consumption, by sector, in 2008 was: 34.4 percent commercial and residential; 34/1 percent industrial; 28.7 percent electric; and 2.8 percent transportation.

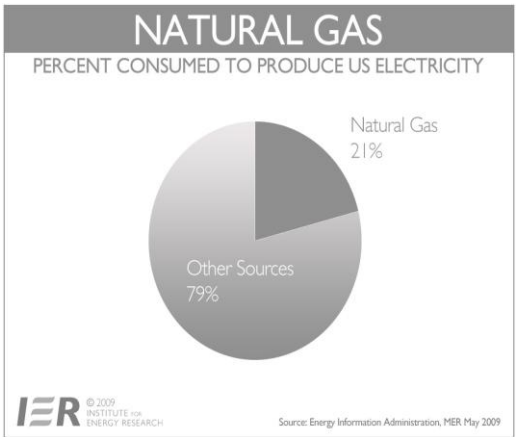


[Source: Institute for Energy Research]

Natural gas is a key component of many products used in daily life. It is an essential material in such products as propane, paints, fertilizer, plastics, antifreeze, dyes, and medicines. It is used by industry as an energy source and by families and businesses to provide heating and cooling.

Currently, natural gas provides approximately 24 percent of the total U.S. energy supply. About 21 percent of the fuel is used to generate electricity. Production of natural gas in the U.S. was 20.6 trillion cubic feet in 2008 while demand was 23.2 trillion cubic feet. Since the demand for natural gas has been larger than current domestic production in recent years, the U.S. has been importing natural gas, primarily from Canada via pipelines. The U.S. is also importing some liquid natural gas (LNG), transported by ship from overseas sources; this method requires special port facilities to handle the condensed gas.





[Source: Institute for Energy Research]

Proven natural gas reserves in the U.S. total some 238 trillion cubic feet. The Energy Information Administration expects domestic production of natural gas to increase 12 percent by 2030.

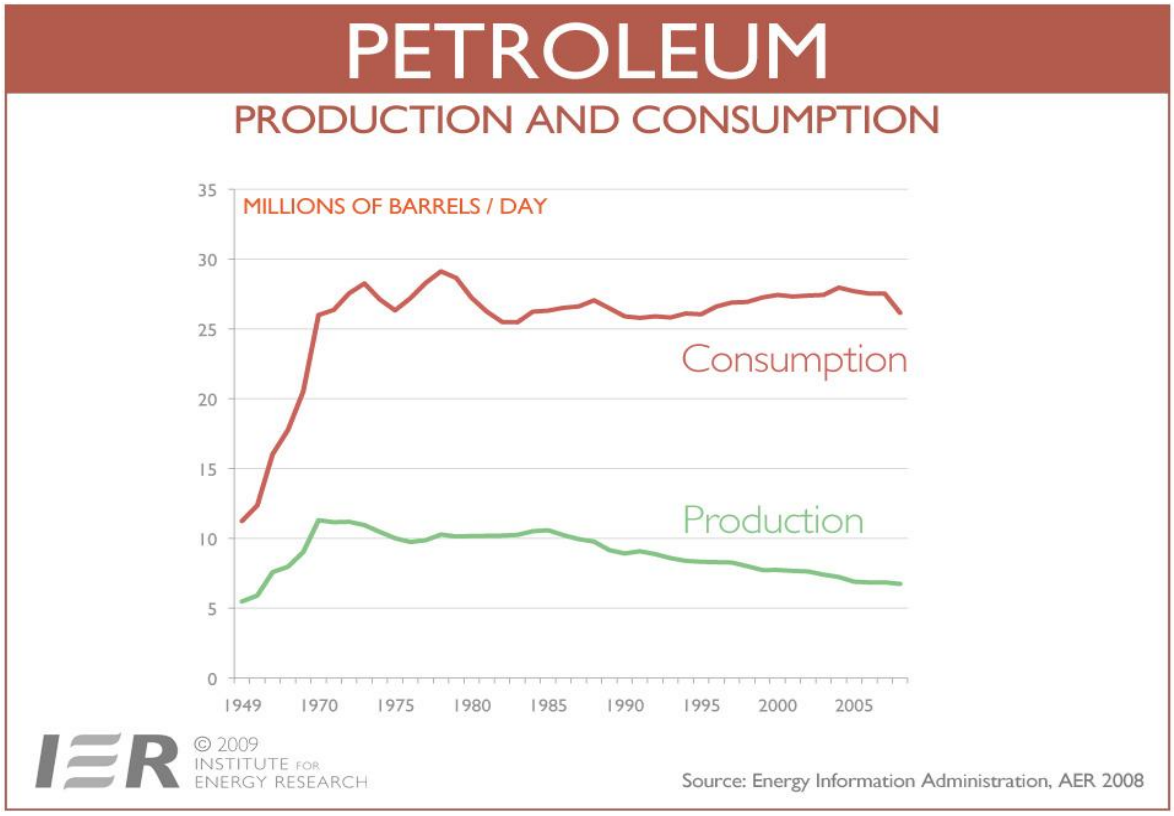
Sources: EIA, Monthly Energy Review, May 2009,
http://www.eia.doe.gov/emeu/mer/pdf/pages/sec1_7.pdf ;
http://www.eia.doe.gov/oiaf/ieo/pdf/0484(2009).pdf;
http://www.eia.doe.gov/emeu/mer/pdf/pages/sec4_3.pdf ;
EIA, Annual Energy Outlook 2009,
http://www.eia.doe.gov/oiaf/servicerpt/stimulus/pdf/stimulus.pdf]

Supply Crunch for Fossil Fuels?

Despite recent economic downturns worldwide, forecasters expect continued economic growth. The International Energy Agency (IEA), located in Paris, projected in a November 2008 report that fossil fuels would account for 79 percent of the overall increase in worldwide energy demand between 2006 and 2030:

> *Oil remains the single largest fuel, though its share in global demand falls from 34 percent to 30 percent….In line with the spectacular growth of the past few years, … coal sees the biggest increase in demand in absolute terms, jumping by 61 percent between 206 and 2030, and pushing its share of total energy demand up from 26 percent to 29 percent.*
>
> [Organization for Economic Cooperation and Development, International Energy Agency, World Energy Outlook, November 2008]

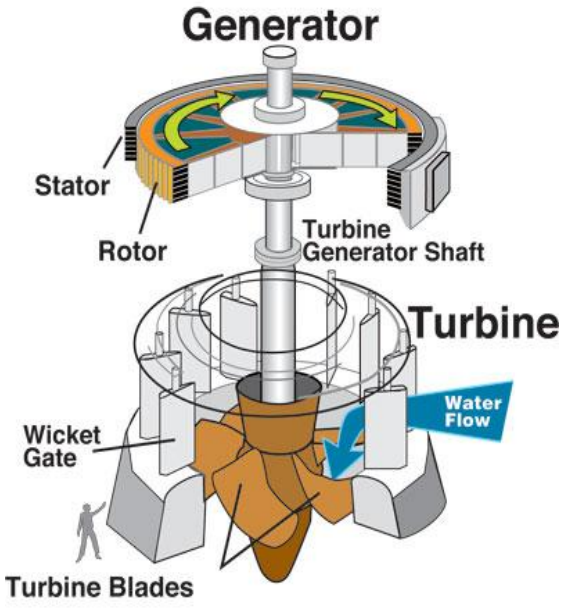
This forecast is similar to estimates from the EIA, which sees fossil fuels, led by petroleum, leading global demand for energy in 2030. It also predicted global consumption of oil would rise 25 percent between 2006 and 2030 with increases of natural gas and coal increasing 46 percent and 49 percent, respectively. [EIA, International Energy Outlook 2009 -- http://www.eia.doe.gov/oiaf/ieo/pdf/0484(2009).pdf]



[Source: Institute for Energy Research]

Hydropower.

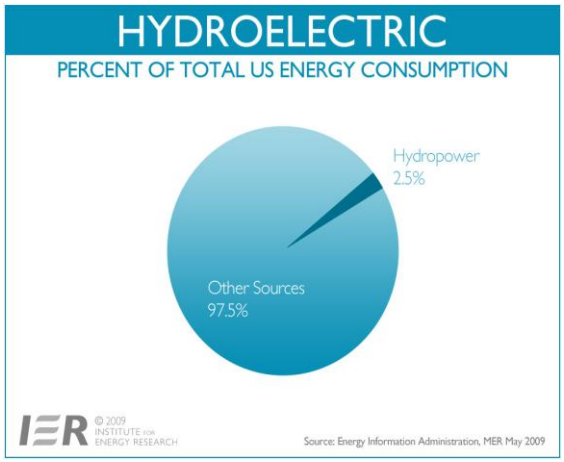
Hydropower is power that is derived from the force of moving water. Long before it was used to generate commercial electric power, hydropower was used to operate watermills, textile machines, saw mills, and lifts around the world. Today, most hydroelectric power originates from dammed water that drives a turbine and generator.



[Source: U.S. Army Corps of Engineers]

Hydropower constituted about 2.5 percent of energy consumed in the U.S. in 2008.

Source: EIA, http://www.eia.doe.gov/emeu/mer/pdf/pages/sec1_7.pdf ;
http://www.eia.doe.gov/emeu/mer/pdf/pages/sec7_5.pdf]



[Source: Institute for Energy Research]

The State of Washington leads the U.S. in hydroelectric power generation, which accounts for nearly 75 percent of the state's electricity generation. Other states with large hydroelectric generating capacities include California, New York, Oregon, and Alabama.
[See: EIA, http://tonto.eia.doe.gov/state/]

There are several distinct advantages to the use of hydropower:

1. Hydroelectricity eliminates the cost of fuel and thus, in the case of the U.S., makes importing fossil fuels unnecessary.
2. Hydroelectric plants tend to have longer lives than fuel-fired generating plants.
3. Since hydroelectric dams do not burn fossil fuels, they do not produce carbon dioxide directly.
4. Hydroelectric power is a clean and renewable source, based upon the availability of a constant flow of water, which is achieved by locating the dams on rivers.

There are some disadvantages to hydropower:

1. There have been some instances of dam failures due to poor design and construction or natural disasters, such as earthquakes or heavy rains.
2. Hydroelectric plants may negatively affect the environments both up- and downstream of the dam site. In many cases, water is warmer when exiting the dam, thus disrupting the ecosystem downstream.
3. Human and animal populations often need to be relocated where the dams and reservoirs are planned.

   [See: "Hydroelectricity," http://en.wikipedia.org/wiki/Hydroelectricity]

Nuclear Energy.

Nuclear power results from the process of splitting atoms, commonly known as nuclear fission. The controlled nuclear chain reaction generates heat, which is then used to boil water, produce steam, and drive turbines that generate electricity. In 2007, the International Atomic Energy Agency reported that there were 439 nuclear power reactors operating in 31 nations around the world. Approximately 14 percent of the world's electricity came from nuclear power.

The U.S., which is home to 104 nuclear power plants, produces the most nuclear energy. Those plants generate roughly 20 percent of America's electricity, or approximately 8.5 percent of its total energy. Between 1973 and 2008, electricity generated from these plants increased from 80,000 megawatt hours to over 800,000 megawatt hours. This substantial increase indicates that plants have become more reliable and are able to produce more energy.

Source: EIA, Monthly Energy Review,
http://www.eia.doe.gov/emeu/mer/pdf/pages/sec1_7.pdf;
http://www.eia.doe.gov/emeu/mer/pdf/pages/sec7_5.pdf

[Source: Institute for Energy Research]

The U.S. produces the most nuclear energy, but derives a much smaller percentage of electricity from nuclear technology than other industrial countries. France produces the highest percentage of its electrical energy from nuclear reactors – 78 percent in 2006. Other nations producing a high percentage of power from nuclear energy include Lithuania (72.8 percent), Belgium (56.1 percent), Sweden (44.9 percent), Switzerland (39.5 percent), and South Korea (38.1 percent). The European Union as a whole obtains 30 percent of its electricity from nuclear power.

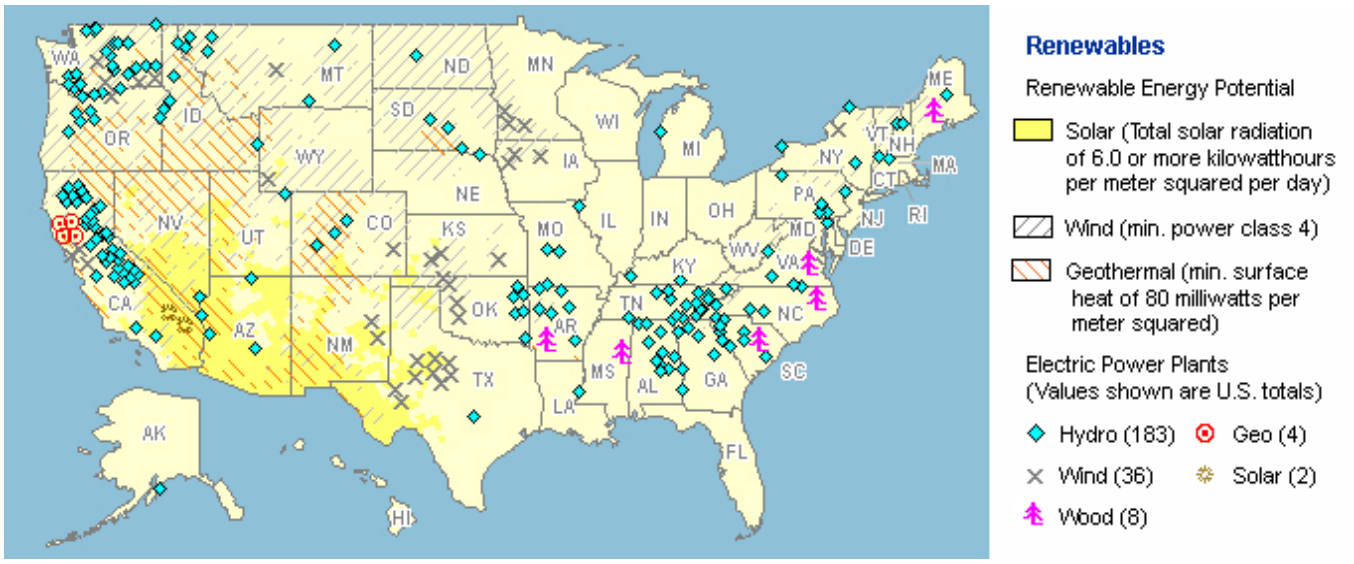
Advocates of nuclear energy as a principal future source of energy contend that nuclear energy is reliable, reduces carbon emissions, and increases energy independence and security by decreasing dependence on foreign oil. They also argue that the risks posed by storing nuclear waste can be further reduced by using the newest technology in reactors and reprocessing the fuel.

Opponents of nuclear energy claim that it is a dangerous energy source. They point to accidents at Three Mile Island Nuclear Generating Station in Pennsylvania (1979) and Chernobyl Nuclear Power Plant in the Ukraine (1986). They also voice concern about the safe disposal and isolation of spent fuel from reactors and waste from reprocessing plants.

To address the issues of nuclear waste disposal, the U.S. Department of Energy proposed the Yucca Mountain Repository in Nevada to be the site of a deep storage facility for spent nuclear reactor fuel and other radioactive waste. President George W. Bush approved the plan in 2002. In 2009, the Obama administration concluded that the site was no longer an option and that funding for the site be eliminated until the administration devised a new strategy toward nuclear waste disposal. On 5 March 2009, Energy Secretary Steven Chu told a Senate hearing that the Yucca Mountain site was no longer viewed as an option for storing reactor waste. This was a change in direction from the Nuclear Waste Policy Act, amended in 1987, which designated Yucca Mountain as the national repository. In July 2009, the U.S. House of Representatives, contrary to the request of the Obama administration, voted 388 to 30 not to defund the Yucca Mountain repository.

RENEWABLE SOURCES

The U.S. Department of Energy defines renewable energy as those resources that can be replenished in a relatively short period of time. Renewable sources include hydropower, wood biomass, alternative biomass fuels (e.g., ethanol and biodiesel), waste, geothermal, wind, and solar.



Source: Energy Information Administration, http://tonto.eia.doe.gov/state/

A variety of factors have led the U.S. to examine the viability of renewable energy:

1. Concerns about the impact of fossil fuels on the environment (e.g. climate change or global warming) have led researchers to seek carbon-neutral sources of power.
2. Higher prices for oil and the dependence upon foreign sources have led many to pursue a policy of "energy independence," which would find new sources that would not run out.
3. New technologies have made it possible to capture and harness energy from previously unused sources.
4. Renewable energy presents opportunities for the development of new "green" jobs in the world economy.

In 2008, roughly 7 percent of all energy consumed in the U.S. was from renewable sources. They also accounted for approximately 9 percent of the nation's total electricity production.

Source: Energy Information Administration, Monthly Energy Review, May 2009, Table 1.3, http://www.eia.doe.gov/emeu/mer/pdf/pages/sec1_7.pdf ; EIA, Monthly Energy Review, May 2009, Table 7.2a, http://www.eia.doe.gov/emeu/mer/pdf/pages/sec7_5.pdf

The distribution of U.S. renewable consumption by source in 2008 was:

- **Hydropower 34%**
- **Biomass Wood 28%**
- **Biomass Waste 6%**
- **Biomass Biofuels 19%**
- **Wind 7%**
- **Other 6%**

Source: Energy Information Administration, Monthly Energy Review, May 2009, Table 10.1, http://www.eia.doe.gov/emeu/mer/pdf/pages/sec10_3.pdf

Hydropower remains the largest source of renewable energy while solar power is the smallest, accounting for about .02 percent of the total electricity produced in the U.S.

Source: EIA, Monthly Energy Review, May 2009, Table 7.2a, http://www.eia.doe.gov/emeu/mer/pdf/pages/sec7_5.pdf]

Demand for energy in the U.S. will continue to grow, and it is expected that renewable energy sources will become a more widely recognized and utilized source in the coming years, particularly given growing concerns about the environment, continued dependence on foreign sources, and government incentives to develop new clean technologies. The growth in renewable sources was spurred by the adoption of the Energy Independence and Security Act of 2007, which seeks to

move the United States toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government, and for other purposes.

[See: Energy Independence and Security Act of 2007, http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_public_laws&docid=f:publ140.110]

The increased pursuit and development of renewable energy sources is also due to other pieces of federal legislation:

1. The Federal Renewable Fuel Standard, signed by President George W. Bush in August 2005, which seeks to double the use of ethanol and biodiesel by 2012 [http://www.ethanolrfa.org/policy/regulations/federal/standard/];

2. The state Renewable Portfolio Standards, which mandates the use of renewable generating technologies in the electric sector of 28 states and the District of Columbia; [http://apps1.eere.energy.gov/states/maps/renewable_portfolio_states.cfm];
3. The Emergency Economic Stabilization Act of 2008 and the American Recovery and Reinvestment Act of 2009, both of which were adopted as a means to stimulate the U.S. economy during the recent economic crisis and which included energy-related provisions. [http://en.wikipedia.org/wiki/Emergency_Economic_Stabilization_Act_of_2008]

Biomass

Biomass consists of biological materials derived from living or recently living organisms, such as wood, waste, and alcohol. Biomass is most commonly plant matter grown to generate electricity or produce heat and includes forest residues, wood chips, and biodegradable wastes. Some of the more common sources besides wood and waste are switchgrass, corn, hemp, and sugarcane. [For more information, see the Biomass Energy Centre, http://www.biomassenergycentre.org.uk/portal/page?_pageid=76,15049&_dad=portal&_schema=PORTAL]

There are three basic biomass sources for biomass-based energy in the U.S. Collectively, these sources represent over half of the total renewable energy production:

- Wood energy comes from use of harvested wood and wood waste.
- Waste energy consists of municipal solid waste, manufacturing waste, and methane gas or biogas captured from landfills.
- Biofuels such as ethanol (made from corn or sugar cane) and biodiesel (made from left-over food products like oils and fats), have become increasingly popular because of government mandates to encourage increased use.

Source: EIA, Monthly Energy Review, May 2009, Table 1.3,
http://www.eia.doe.gov/emeu/mer/pdf/pages/sec1_7.pdf
http://www.eia.doe.gov/cneaf/solar.renewables/page/biomass/biomass.html

While biomass-based energy offers promise for the future, there are some concerns regarding its impact on the environment:

1. Biomass, such as wood, can pollute the air when burned. As a result, some communities have banned the burning of firewood.
2. While ethanol has been viewed as a means of reducing carbon dioxide emissions, a study published in *Science* concluded that the use of corn-based ethanol nearly doubles the greenhouse gas emissions over an extended period of time.

Source: "Use of U.S. Croplands for Biofuels Increases Greenhouse Emissions from Land-Use Change," *Science*, 29 February 2008, Vol. 319, No. 5867, pp. 1238-1240. http://www.sciencemag.org/cgi/content/abstract/1151861

Ethanol and Biodiesel

Ethanol is a renewable fuel that is a clear, colorless, slightly toxic alcohol made from sugars found in grains such as corn, sugar beets, and sugarcane. Its use as a fuel is fairly recent, though between 1908 and 1927 Henry Ford produced the first automobile (the Model T) to run on pure anhydrous (ethanol) alcohol.

The first significant use of ethanol was in the 1970s in response to the OPEC oil embargo, which highlighted the U.S. dependence on foreign oil. Ethanol continued as a very small contributor to energy supplies during the low oil prices of the late 1980s and throughout the 1990s, growing in use as a gasoline additive. Early in the 2000s, the U.S. Congress mandated its use to supplement gasoline, and the amount required by law to be mixed into fuel has gradually increased over the years.

In the U.S. ethanol is blended with gasoline to produce E85 (85 percent ethanol, 15 percent gasoline) and E10 (10 percent ethanol and 90 percent gasoline – "gasohol"). All automobiles are capable of using E10, and increasingly, automakers are offering E85 vehicles ("flex fuel vehicles") that can use this fuel interchangeably with other gasoline.

Following the 1973 oil crisis, the Brazilian government made mandatory the use of ethanol blends with gasoline; 100 percent ethanol-powered vehicles were launched in their market in 1979. ["Flexible-fuel vehicle," http://en.wikipedia.org/wiki/Flexible-fuel_vehicle The U.S. has recently joined Brazil as one of the world's leading producers of ethanol. In 2008, some 170 ethanol plants in the U.S. produced 9.24 billion gallons of ethanol – five times the amount produced a decade earlier. The Renewable Fuels Association reports that there are 17 plans currently under construction in the U.S. with a capacity of 1.25 billion gallons.

[See: Renewable Fuels Association, http://www.ethanolrfa.org/industry/statistics/ ; http://www.ethanolrfa.org/industry/locations/]

There is a difference between the production of ethanol in Brazil and the U.S. Brazil uses sugarcane as its source for ethanol; the U.S. primarily uses corn. Since corn yields less than sugarcane and the refining process uses more energy, U.S. ethanol producers depend upon a 51 cent per gallon tax credit and a 54 cent per gallon tariff on imported ethanol to remain competitive. ["Ethanol," http://en.wikipedia.org/wiki/Ethanol#As_a_fuel]

The emergence of ethanol as a fuel has raised a couple key challenges within the U.S.:

1. Since the U.S. depends upon corn (a primary food source) for its source of ethanol, the price of corn and corn products have increased considerably in recent years as land once designated for food production now competes to produce corn for an energy source. Consequently, this has raised numerous ethical concerns about using a primary food source for fuel.

2. The increase in corn-for-ethanol farming raises the possibility of strains on the extent and quality of the Midwest's water supply.
   ["Water Implications of Biofuels Production in the United States," The National Academies --
   http://www7.nationalacademies.org/ocga/briefings/Water_Implications_of_Biofuels_Production.asp]

The growth of U.S. corn ethanol as a transportation fuel to supplement petroleum is continuing. Several new ethanol plants are under construction in the corn-rich Midwest (Indiana, Illinois, Iowa). But, as debates regarding the corn-for-fuel process vs. corn-for-food continue, many of the same states are exploring an expansion of their biofuels initiative to include the conversion of cellulosic biomass into the "next generation" of ethanol fuel.

Biodiesel is another renewable fuel that is derived from vegetable oils, animal fats, or grease. Most biodiesel is made from soybean oil. Biodiesel is usually blended with petroleum diesel in varying ratios. This is an important step towards a new alternative fuel, though biodiesel fuel remains in its infancy.

Geothermal

Geothermal energy is power that is harnessed from the natural heat of the earth. To generate electricity, hot water or steam extracted from geothermal reservoirs is piped to steam turbines that drive generators at electric utilities. In other instances, hot water or steam is piped directly for direct-use applications such as space heating. This resembles the use of hot springs used by earlier civilizations.

Energy experts claim that geothermal power is cost effective, reliable, and environmentally friendly, though they admit that it is more limited to specific areas characterized by tectonic plate boundaries. Still, it is gaining support as a contributor to an overall energy portfolio. The largest group of geothermal plants in the world is located at the Geysers, a geothermal field located north of San Francisco, California. This facility, consisting of 22 separate power plants that utilize steam from over 300 wells, is capable of outputting over 750 megawatts. ["The Geysers," http://en.wikipedia.org/wiki/The_Geysers ; Calpine/The Geysers, http://www.geysers.com/]

The Energy Information Administration estimated that geothermal provides only one-third of one percent of all energy consumed in the U.S. One key advantage to geothermal power is that it does not burn fuel to produce electricity. Consequently, the emission of carbon dioxide is minimal or non-existent.

Source: EIA, Monthly Energy Review, May 2009, Table 1.3,
http://www.eia.doe.gov/emeu/mer/pdf/pages/sec1_7.pdf]

The U.S. is the largest producer of geothermal power, even though it accounts for only one-third of one percent of total U.S. electricity generated. The top ten nations with geothermal electric generating capacity (in megawatts) include:

United States	2687
Philippines	1969
Indonesia	992
Mexico	953
Italy	810
Japan	535
New Zealand	471
Iceland	421
El Salvador	204
Costa Rica	162

Source: "World Geothermal Generation in 2007," *Geo-Heat Centre Quarterly Bulletin*, 28: 3 (8-19) http://geoheat.oit.edu/bulletin/bull28-3/art3.pdf

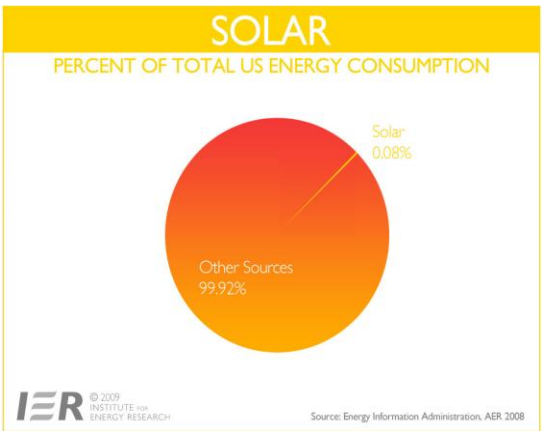
In 2005, the U.S. Congress adopted legislation to encourage the use of geothermal energy on government lands. The Energy Policy Act (HR 6) provided significant improvements for geothermal energy in terms of tax credits, which is expected to be a major driver behind increased geothermal power production.

Solar

Solar power is the result of capturing and converting sunlight into electricity. Current technology uses two different approaches:

1. Solar thermal collectors gather thermal radiation. Fluid circulating through the system can be used as a heat source or may be used to turn a turbine to generate electricity.
2. Photovoltaic cells generate electrical current by converting light into electric current (e.g. photons into electrons).

Solar energy plays a minor role in U.S. energy generation. Today, it provides less than 0.1 percent of the total energy consumed and accounts for 0.02 percent of electricity generated – the lowest amount of any of the renewable sources.



[Source: Institute for Energy Research]

One of the key means of gathering solar power is through Concentrating Solar Power (CSP) systems. These systems use a computerized tracking system connected to large lenses or mirrors that focus a large area of sunlight into a small concentrated beam, which is then used as a power source. There are other means of gathering and concentrating solar power, such as a "dish energy system," a "solar power tower,"and a "solar bowl." ["Solar power," http://en.wikipedia.org/wiki/Solar_power#Photovoltaics]

In the past couple decades, there have been concerted efforts to expand the U.S.' solar capacity. One of the principal ways has been to construct homes and buildings that have photovoltaic cells integrated into roofs and/or sides of buildings. However, one of the key challenges facing the use and expansion of solar power involves the consistency of the source. Changes in the weather and the changing position of the earth affect the ability to generate a consistent source of solar energy. Another challenge is the overall cost of solar technology, which is more expensive than other more widely used renewable sources.

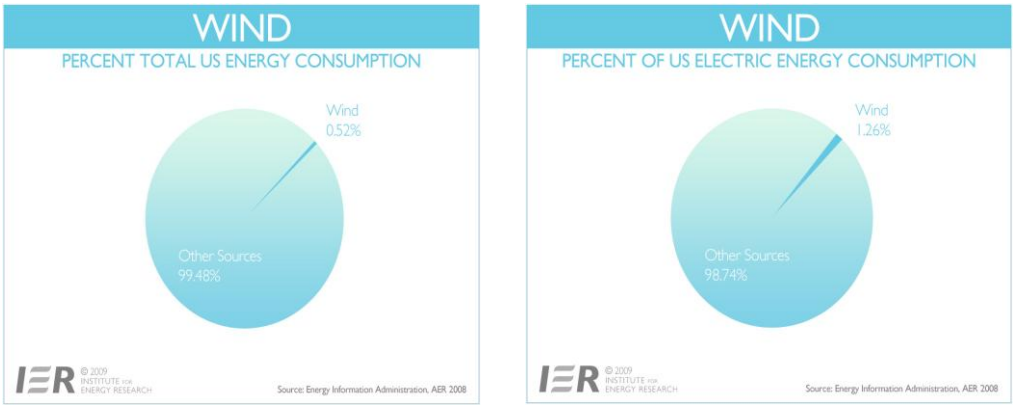
The Institute for Energy Research reports that solar technologies are improving. However, it concludes that meeting the nation's energy needs through the use of photovoltaic cells would require an area of about 10,000 square miles of solar panels – an area the size of New Hampshire and Rhode Island combined. While the U.S. Southwest offers great potential for generating solar power, consideration would need to be given to the construction of transmission lines over great distances. Thus, solar energy is likely to remain a very small portion of the nation's overall energy source, though it might gain some popularity in individual applications such as homes and businesses.

Wind

Wind power is the conversion of wind energy into electricity or other forms of power by using wind turbines or windmills. This technique has been used for centuries for milling grain and for pumping water, such as used by the Netherlands to drain their reclaimed sea lands.

Up until recent decades, wind power in the U.S. was a more individualized experience. Farmers often installed windmills to generate electrical energy and power for pumping water on their farms. Today, wind power is typically generated by large wind farms that are located on vast stretches of land or along coastlines.

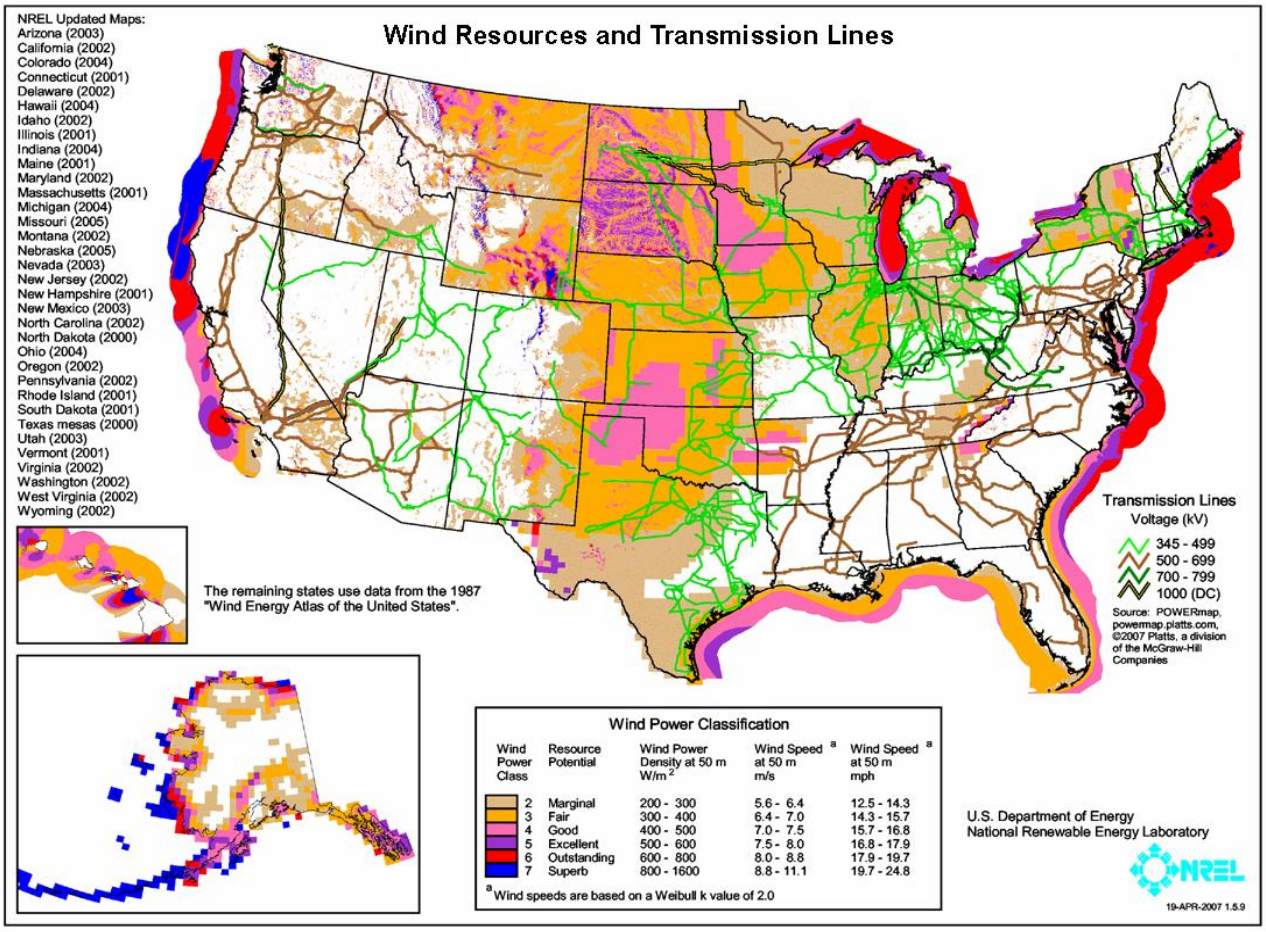
In 2008, wind power provided almost one-half of one percent of all energy consumed in the U.S. While the use of wind power has increased in the past few decades, it still constituted approximately 1.3 percent of all electricity generated in the nation.



[Source: Institute for Energy Research]

There are several challenges associated with generating wind power:

1. The National Renewable Energy Laboratory of the U.S. Department of Energy reports that there are few areas in the U.S. that possess the necessary "wind power class" to make wind power economically feasible. (see map on following page)
2. Wind power requires an extensive amount of land, usually flat farmland or along the coast of oceans or lakes.
3. Though wind farms release no emissions into the air, there are some environmental concerns:
    - Rotating wind turbines can injure or kill birds and bats. Recent studies, however, indicate that the impact has been negligible.
    - Some argue that wind farms degrade the aesthetics of landscapes and seascapes where they are located.
    - Some individuals have complained about noises and vibrations as the blades turn.



[Source: National Renewable Energy Laboratory, U.S. Department of Energy]

There has been a substantial growth in the development and use of wind power in the U.S. in recent years. This can be attributed to tax credits from state and federal governments as well as mandates for increased production and use of renewable energy. For example, the Energy Improvement and Extension Act of 2008 extends existing tax credits for renewable energy initiatives, including wind.

Worldwide, wind energy also is becoming more popular. World wind generation capacity more than quadrupled between 2000 and 2006, essentially doubling every year. Denmark generates nearly one-fifth of its electricity with wind turbines – the highest percentage of any nation. Denmark is also a leader in the manufacturing and use of wind turbines. Furthermore, the top five nations have seen tremendous capacity growth in the past four years, indicating the increased popularity of and potential for wind power. [See: "Wind power in Denmark," http://en.wikipedia.org/wiki/Wind_power_in_Denmark]

Windpower Capacity (megawatts)

Nation	2005	2006	2007	2008
United States	9,149	11,603	16,818	25,237
Germany	18,415	20,622	22,247	23,933
Spain	10,028	11,615	15,145	16,543
China	1,260	2,604	6,050	12,121
India	4,430	6,270	8,000	9,655

[Source: World Wind Energy Association, www.wwindea.org]

As indicated in the chart above, the U.S. has added more wind energy to its grid in the past four years than any other nation, surpassing Germany in 2008. The State of California was one of the leaders in the wind power industry and led the U.S. in installed capacity for many years. By the end of 2006, the State of Texas became the leading wind power state in the U.S. Continued studies by the U.S. Department of Energy have concluded that wind harvested in the states of Kansas and North Dakota as well as around the Great Lakes could be a great source of future energy. [U.S. Department of Energy, "Wind Energy Multiyear Program Plan for 2007-2012," http://www1.eere.energy.gov/windandhydro/pdfs/40593.pdf]

Wave and Tidal Power

There are two other forms of renewable sources, though neither is currently widely employed.

Wave power is the transport of energy by ocean surface waves. Energy is produced when electricity generators are placed on the surface of the ocean. Output is determined by wave height, speed, wavelength, and water density. To date, there are only a few experimental wave generator plants in operation. The world's first commercial wave farm is located at Agucadoura Wave Park near Povoa de Varzim in Portugal. Opened in September 2008, the farm, conceived by Portuguese energy company Enersis and commissioned by Pelamis Wave Power, uses three wave energy converters to convert the motion of the ocean surface waves into electricity. ["Agucadoura Wave Park," http://en.wikipedia.org/wiki/Agu%C3%A7adoura_Wave_Park ; "Wave Power," Alternative Energy News, http://www.alternative-energy-news.info/technology/hydro/wave-power/]

Tidal power converts the energy of tides into electricity. Large underwater turbines are placed in areas with high tidal movements, and are designed to capture the kinetic motion of ebbing and surging tides to produce electricity. The technology for this form of energy generation is not well developed at this time, but there are a variety of designs that are being tested. Among them is the European Marine Energy Centre, located in the United Kingdom. ["Tidal Power," http://en.wikipedia.org/wiki/Tidal_power; "Tidal Power," Alternative Energy News, http://www.alternative-energy-news.info/technology/hydro/tidal-power/ ; European Marine Energy Centre, http://www.emec.org.uk/]

THE DEMOCRATIC PARTY AND THE OBAMA ADMINISTRATION – ENERGY POLICIES FOR THE 21ST CENTURY

New Energy for America: The Obama Campaign

During the campaign for the Democratic nomination for President, Senator Barack Obama (Dem.-Illinois) campaigned on key issues that he said were designed to "build a lasting foundation for America's economic prosperity and security." One such topic was what he labeled "new energy." Obama argued that America should be the 21st century clean energy leader by harnessing the power of alternative and renewable energy, ending dependency on foreign oil, addressing the global climate problems, and creating 5 million new jobs that remain in the United States.

To accomplish this, Obama called for two key changes in U.S. energy policy:

1. **Invest in clean, renewable energy:** Obama called upon the U.S. to generate 25 percent of energy from renewable sources by 2025. To do so would require investments in clean, renewable energy, such as solar, wind, biofuels, and geothermal.
2. **Fight climate change:** Obama called for the U.S. to acknowledge the problem of climate change and work towards improving energy efficiency and conservation, which will lead to decreased pollution and the detrimental impact on the environment.

[Source: http://www.barackobama.com/issues/newenergy/index.php]

On 5 August 2008, Democratic presidential candidate Obama gave a speech on energy in Youngstown, Ohio. In his presentation, Obama argued that the U.S. is "facing a set of challenges unlike any we've ever known" – war and terrorism; economic turmoil; a changing climate; among others. He concluded that central to these challenges was what the U.S. intended to do about its "addiction to foreign oil." Obama noted that he agreed with Senator John McCain (Rep. – Arizona) and Republican presidential candidate who had said:

> *Our dangerous dependence on foreign oil has been thirty years in the making, and was caused by the failure of politicians in Washington to think long-term about the future of the country.*

Obama proceeded to criticize the administration of President George W. Bush as well as Senator McCain for failing to push for new energy policies that would free the U.S. from dependence on foreign sources of energy and that would promote a cleaner environment for the present and future. Obama particularly noted that Senator McCain's campaign had not offered any significant investments in energy sources of the future – alternative sources – and essentially had offered a continuation of the Bush energy policies.

As the nation transitions to renewable energy, Obama called upon the U.S. to increase domestic production of oil and natural gas. He noted that oil companies have access to some 68 million acres where they are not drilling. "So we should start by giving them a choice: use the land you have, or give up your leases to someone who will."

Obama pledged that, as President, he would direct the full resources of the federal government and the energy of the private sector to eliminate the need for oil from the Middle East and Venezuela. He called for an investment of $150 billion over the next decade and leveraging additional billions in private capital to harness American energy and create new American jobs.

Obama set forth three major steps to achieve these goals:

1. Commit to placing one million plug-in hybrid cars on American roads within six years and that those automobiles would be built in the U.S. This would be accomplished by investing in research and development, providing loans and tax credits to automobile companies so they can re-tool their factories; and give consumers a tax credit to buy new automobiles.

2. Double the amount of energy that comes from renewable sources by the end of 2012. This would mean investing in clean technology research and development, tax incentives to encourage production of renewables and new biofuels, finding safer ways to use nuclear power, and modernizing the utility grid to accommodate new power sources. The payoff from these investments would be the creation of new jobs in the renewable energy sector.

3. Call upon business, government, and the American people to reduce the demand for electricity 15 percent by the end of the next decade. This would involve a combination of conservation, developing and utilizing more energy-efficient appliances, weatherizing homes and businesses, among other things.

Obama argued that by following these steps, America, over the course of ten years, would produce enough renewable energy to replace all of the oil that is imported from the Middle East, thus freeing the U.S. from dependency on oil from unstable regions of the world.

In concluding, Obama said that the U.S. could "continue down the path we've been traveling," making small investments in renewable energy, continuing to send U.S. dollars to Middle Eastern nations for oil, and watching other nations create new technologies that will fuel the future. Or, he said the nation can embark upon a different path that results in new technologies, re-opened factories that provide new jobs, and greater energy efficiency across the U.S. "We can lead the world, secure our nation, and leave our children a planet that is safer and cleaner and healthier than the one we inherited."

For the full text of the speech, see the Appendices or click: http://www.cfr.org/publication/16903/

The Democratic National Committee Platform

In preparation for the nomination of Barack Obama and Joseph Biden as the party's candidates for president and vice-president, the Democratic National Committee drafted and adopted its 2008 party platform entitled "Renewing America's Promise." The document called for a new direction for the nation in response to what the Democrats called failures by the outgoing Bush administration. They called for new approaches, new policies, and new ideas to address the challenges facing the American nation.

One of the key parts of the platform, "New American Energy," focused on new directions in energy policy. The Democrats acknowledged that "America needs a new bold and sustainable energy policy to meet the challenges of our time." The party cited the threat to U.S. national security by being too dependent upon foreign sources of oil. The following are the key components of the party's platform:

- New jobs to develop new energy solutions – Recognizing the importance of developing new jobs at home, the Democrats called for "government procurement policies to incentivize domestic production of clean and renewable energy." (17)
- Creation of a green energy sector – The Democrats committed to a fast-track investment of billions of dollars over ten years to develop a green energy sector that would create up to five million jobs. They noted that many Americans were calling for an initiative like the Manhattan Project (atomic bomb) or Apollo space program that would put the nation on the "fast track" to achieve energy independence within a specified period of time.
- Make America 50 percent more energy efficient by 2030 – This would be accomplished through the development of new renewable energy technologies, the creation of advanced battery technologies, developing a "smart grid," cleaning up coal plants, and increasing fuel efficiency of vehicles. It would also emphasize making all buildings more energy efficient.
- Secure at least 25 percent of electricity from renewable sources by 2025 – This would be achieved through investing in new renewable sources (e.g. solar, hydro, etc.) and the development of new battery technology.
- Invest in biofuels to provide an American-produced fuel – This initiative would turn to use corn, switchgrass, or other bio-materials to create an alternative fuel source to power the nation's vehicles.

The Democratic Party platform concluded:

> *This plan will safeguard our economy, our country, and the future of our planet. This plan will create good jobs that pay well and can't be outsourced. With these policies, we will protect our country from the national security threats created by reliance on foreign oil and global insecurity due to climate change. And this is how we'll solve the problem of four-dollar-a-gallon gas—with a comprehensive plan and investment in clean energy*. (18)

For the full text of the 2008 Democratic National Committee platform 2008, see the Appendices or click: http://www.democrats.org/a/party/platform.html

The Obama – Biden Plan for "New Energy for America"

For the presidential campaign of 2008, the Obama –Biden team elaborated upon earlier energy-related speeches and the Democratic Party Platform by developing a detailed outline for energy policies for an Obama presidency. Key elements of the plan included:

- Tackling climate change
- Investing in a secure energy future and creating millions of new jobs
- Making vehicles more fuel efficient
- Promoting the supply of domestic energy
- Diversifying energy sources
- Committing to efficiency to reduce energy and lower costs

The Obama-Biden campaign argued that these plans would help to transform the American economy, ranging from automobiles to fuels to industry to homes. It would also work to achieve energy independence for the U.S. Lastly, it would be good for the nation since it would create new jobs and assist others in transitioning to a "clean energy economy."

The following is a summary of the Obama-Biden "New Energy Plan for America":

1) Tackle climate change:

   a) Support the implementation of an economy-wide cap & trade system to reduce carbon emissions – 80% below 1990 levels by 2050. This market mechanism is intended to give consumers and businesses incentives to use ingenuity to develop effective solutions to climate change. The plan requires an auction on pollution credits. Industries pay for every ton of emissions they release rather than give those rights away to companies on the basis of past pollution. A small portion of the receipts generated (an estimated $15 billion/year) would be used to support the development of clean energy, invest in energy efficiency improvements, and help develop the next generation of biofuels and clean energy vehicles. It would also provide funds to state and federal land and wildlife managers to restore habitats, create wildlife migration corridors, and assist fish and wildlife initiatives.

   b) Make the U.S. the leader on climate change -- The U.S. must participate with other nations in reducing emissions. Obama and Biden want the U.S. to re-engage with the UN Framework Convention on Climate Change (UNFCC), the key organization addressing climate problem.

2) Invest in Secure Energy Future & Create 5 million new jobs:

   a) Invest in a "clean energy" economy to create new green jobs -- Obama and Biden call for investing $150 billion over 10 years to accelerate the commercialization of plug-in hybrids, promote the development of renewable energy, invest in low emission

coal plants, advance a new generation of biofuels and fuel infrastructure, and begin the transition to a new digital electricity grid. The plan also calls for investments in the skilled manufacturing workforce and centers to help transition to green technologies.

b) Create a "green vet initiative" – This initiative would provide counseling and job placement to help U.S. veterans gain the necessary job skills to enter a new energy economy.

c) Convert manufacturing centers into clean technology leaders – Obama and Biden want to invest in helping manufacturing centers modernize and develop clean technologies. They propose a federal grant program that will allocate money to the states to identify and support local manufacturers with the most compelling plans for modernizing existing or closed manufacturing facilities to produce new clean technologies. They propose a $1 billion investment per year that will spur sustainable economic growth in communities.

d) Create new job training programs for clean technologies -- Obama and Biden proposed increased funding for federal workforce training programs to include green technologies training, particularly in advanced manufacturing and weatherization. They also would establish an energy-focused youth jobs program to help youth with training to develop skills in this area.

3) Make vehicles more fuel efficient:

a) Increase fuel economy standards 4 percent each year.

b) Invest in developing advanced vehicles and put 1 million plug-in vehicles on the road by 2015 -- Obama and Biden advocate federal investment in advanced vehicles, which can get over 150 miles per gallon. The emphasis would be on new battery technology. They would also leverage private sector funds and support domestic automakers to bring plug-ins and other types to American consumers. They propose a tax credit for consumers who purchase an advanced technology vehicle.

c) Partner with domestic automakers – The federal government would provide a $4 billion retooling tax credit and loan guarantees to domestic auto plants and parts manufacturers to build new vehicles in the U.S.

d) Mandate that all new vehicles are "flexible fuel" – The development of biofuels based upon American biomass will generate new jobs for the American economy and support a revitalized auto industry in the U.S.

e) Develop the next generation of sustainable biofuels and infrastructure – Obama and Biden advocate the development of biofuels, including cellulosic ethanol, biobutenol, and other technologies that produce synthetic petroleum. They set the goal of producing 60 billion gallons of advanced fuels by 2030. They also propose investing

federal money via tax incentives to develop new technologies and infrastructure.

f) Establish national low carbon fuel standard – Intended to speed the introduction of low-carbon non-petroleum fuels, this initiative will move fuel suppliers to reduce carbon in fuels by 5 percent within five years and 10 percent within ten years.

4) Promote supply of domestic energy:

a) Require oil companies to develop existing oil leases or turn them over to another company to develop – Obama and Biden claim that oil companies currently have access to 68 million acres of land, over 40 million acres offshore, which are not being drilled. These should be opened to development.

b) Promote responsible domestic production of oil and natural gas – The federal government and scientists should identify the obstacles to drilling in particular areas, such as Bakken Shale in Montana and North Dakota, which hold an estimated 4 billion recoverable barrels of oil; unconventional natural gas supplies in Texas and Arkansas; and the National Petroleum Reserve in Alaska with 23.5 million acres of federal land.

c) Prioritize construction of Alaska natural gas pipeline – This project, proposed in 1976 and supported by up to $18 billion in loan guarantees by Congress in 2004, should be moved ahead. The pipeline would have the daily capacity of 4 billion cubic feet of natural gas, or an estimated 7 percent of current U.S. consumption.

d) Get more from existing oil fields – Experts believe that some 85 billion barrels of recoverable oil remain stranded in existing fields. Through the use of new technologies and safer drilling practices, those resources should be accessed.

5) Diversify Energy Sources:

a) Require 10 percent of electricity to be from renewable sources by 2012 -- Obama and Biden recommend the creation of a federal Renewable Portfolio Standard (RPS) to require that 10 percent of electricity consumed in the U.S. is derived from clean, sustainable energy sources (e.g. wind, solar, geothermal) by 2012. Many states are currently doing so and Obama believes that the federal government should provide leadership to support new industries and technologies. The new national standard is intended to spur significant private sector investment and create new jobs. Also they propose to extend the federal Production Tax Credit (PTC) for 5 years to encourage the production of renewable energy.

b) Develop and deploy clean coal technology – Obama and Biden believe that carbon capture and storage technologies hold great potential to reduce greenhouse gas emissions. They propose government incentives to accelerate private sector investment in commercial scale zero-carbon coal facilities. They will also direct the Department of Energy to enter into public-private partnerships to develop five "first of a kind" commercial scale coal-fired plants with carbon capture and sequestration.

c) Safe and secure nuclear energy – Before expanding the use of nuclear power further, Obama and Biden believe that the U.S. must address issues pertaining to the security of nuclear fuel and waste, waste storage, and nuclear proliferation. They pledge to make safeguarding nuclear material in the U.S. and abroad a top anti-terrorism priority. With regards to disposal of nuclear waste, Obama does not support the use of Yucca Mountain in Nevada for storage; rather, he pledges federal efforts to seek safe, long-term disposal solutions.

6) Commitment to Efficiency to Reduce Energy Use and Lower Costs: According to the United Nations, the U.S. is the 22nd most energy efficient nation among major economies. Since 1973, average amount of energy use has tripled.

a) Deploy cheapest, cleanest, fastest energy source – Since the Department of Energy projects that demand for electricity will increase 1.1 percent annually, Obama and Biden believe that cutting demand through efficiency is both possible and economical. Obama and Biden propose to reduce demand 15 percent from DOE's projected levels by 2020.

b) Set national building efficiency goals – Obama and Biden propose a goal of making all new buildings carbon neutral or produce zero emissions by 2030. The nation should seek ways of improving the efficiency of existing buildings by 25 percent over the next decade.

c) Overhaul federal efficiency standards –Obama and Biden believe that the Department of Energy must set new appliance efficiency standards.

d) Reduce federal energy consumption – The U.S. government is the world's largest single consumer of energy in world, spending $14.5 billion on energy in FY 2008. Obama and Biden propose that the federal government set an example by reducing energy consumption by 15 percent by 2015.

e) Flip incentives to energy utilities – Obama and Biden believe that incentives to utility companies should be based upon reliability, performance, and efficiency as opposed to total production.

f) Invest in a smart grid – Obama and Biden propose the creation of a Grid Modernization Commission to facilitate the development of Smart Grid practices across the nation's electricity grid. They propose a matching grant program to provide reimbursement of one-fourth of qualifying Smart Grid investments and establishing demonstration projects for power grid sensing, communications, and power flow control.

g) Weatherize 1 million homes annually – Obama and Biden believe that it is essential to promote home weatherization as part of improving the nation's energy efficiency.

h) Build more livable and sustainable communities – Obama and Biden propose that developers explore ways of building more livable and sustainable communities. This would include decisions about development patterns and the use of fuel and energy in communities with special incentives to promote walking, biking, and the use of public transportation.

In a major economic speech given at George Mason University on 8 January 2009, President-elect Barack Obama pledged strong support for clean energy and energy efficiency. Reiterating many ideas from his campaign documents, the President-elect said that his administration would "spark the creation of a clean energy economy" by working to double the production of alternative energy during his term. He also said that he would work to "modernize more than 75 percent of federal buildings and improve the energy efficiency of two million American homes, [thus] saving consumer and taxpayers billions on our energy bills."

["Obama Speech Pushes Clean Energy," *New York Times,* 8 January 2009 -- http://greeninc.blogs.nytimes.com/2009/01/08/obama-speech-pushes-clean-energy/]

The Obama White House

Since taking office on 20 January 2009, President Barack Obama has been actively promoting his "clean energy" initiatives and policies throughout the nation. The following is a summary of those speeches and actions taken in the past ten months.

20 January 2009 -- New White House Office of Energy: Upon taking office, President Barack Obama established the White House Office of Energy and Climate Change Policy. Its first director is Carol Browner who served as administrator of the Environmental Protection Agency (EPA) for eight years under President Bill Clinton. The purpose of this office is to coordinate the administration's policy on energy and climate change.

17 February 2009 -- National Stimulus Bill: Nearly one month after taking office, President Obama signed a $787 billion stimulus package intended to address the economic crisis facing the U.S. The bill included heavy investments in renewable energy and green technology. Some of the appropriations within the legislation included:

- $11 billion for "smart grid" investments
- $3.4 billion for carbon capture and sequestration ("clean coal") demonstration projects
- $2 billion for research into batteries for electric cars
- $500 million to help workers train for "green jobs"
- A three-year extension of the "production tax credit" for wind energy (as well as a tax credit extension for biomass, geothermal, landfill gas and some hydropower projects).

- $5 billion for low-income weatherization programs
- $6 billion in grants for state and local governments
- Several billions to modernize federal buildings with emphasis on energy efficiency.

[Kate Galbraith, "Obama Signs Stimulus Packed with Clean Energy Provisions," Green Inc. blogs, *New York Times*, 17 February 2009]

24 February 2009 -- Address to Joint Session of Congress: President Obama addressed a joint session of the U.S. Congress for the first time five weeks after taking office. In his speech, he identified energy as one of "three areas that are absolutely critical to our economic future." The President repeated his vow to double renewable energy in three years, noting that solar, wind, and biofuels, along with "clean coal" and more efficient vehicles, would receive investments of $115 billion a year. He also expressed his hope that renewable would become a "profitable kind of energy."

He warned that the U.S. had fallen behind other countries in the production of new energy sources. "We know the country that harnesses the power of clean, renewable energy will lead the 21st century. And yet it is China that has launched the largest effort in history to make their economy energy efficient," the president said. He also reported that Germany and Japan were far ahead in solar technology, and that South Korea was making batteries for new plug-in hybrids.

As a nod to clean-energy advocates, the President stated his support for a cap on carbon dioxide emissions: "I ask this Congress to send me legislation that places a market-based cap on carbon pollution and drives the production of more renewable energy in America," he said. "That's what we need."

[Kate Galbraith, "Obama Vows Support for Renewables – and a Carbon Cap," Green Inc. blog, *New York Times*, 25 February 2009 – http://greeninc.blogs.nytimes.com/2009/02/25/obama-vows-support-for-renewables-and- a-carbon-cap/]

23 March 2009 – President Selects Advisors on U.S. Energy Policy: President Obama selected David Sandalow to be assistant secretary for Policy and International Affairs at the Department of Energy. Sandalow is an expert on global warming and oil policy. He is author of the 2007 book *Freedom from Oil: How the Next President Can End the United States' Oil Addiction.* The President also nominated Dr. Steven Koonin to be undersecretary for science at the Department of Energy. Dr. Koonin was a professor of theoretical physics at the California Institute of Technology and scientist at the Lawrence Berkeley National Laboratory. Since 2004, Koonin has served as chief scientist for BP where he has focused on alternative and renewable energy.

22 April 2009 – Speech on Earth Day: President Obama traveled to Newton, Iowa to visit Trinity Structural Towers, a former Maytag appliance factory that now houses a green manufacturing facility, which produces towers for wind energy production. Marking Earth Day, the President reaffirmed his commitment to a comprehensive national energy plan that lessens U.S. dependence upon foreign oil, creates jobs, and moves the nation towards clean energy technology.

"The choice we face is not between saving our environment and saving our economy – it's a choice between prosperity and decline," President Obama said. "The nation that leads the world in creating new sources of clean energy will be the nation that leads the 21st century global economy." He expressed his belief that his new energy policy would jump start an American Clean Energy boom that will create millions of clean energy jobs.

In his speech, the President unveiled a program to develop renewable energy projects on the waters of the Outer Continental Shelf that produce electricity from wind, wave, and ocean currents. The regulations will enable, for the first time, the nation to tap into the ocean's sustainable resources to generate clean energy in an environmentally sound and safe manner.

President Obama also called upon Congress to pass comprehensive legislation to protect the U.S. from the risks associated with reliance on foreign oil and the effects of climate change. He said that any policies adopted to advance energy and climate security should promote economic recovery efforts, accelerate job creation, and drive clean energy manufacturing by:

- Creating new jobs in the clean energy economy;
- Promoting U.S. competitiveness;
- Investing in the next generation of energy technologies;
- Breaking dependence on oil;
- Producing more energy at home;
- Promoting energy efficiency;
- Closing the carbon pollution loophole
- Protecting American consumers.

Source: Fact Sheet: President Obama Highlights Vision for Clean Energy Economy. The White House, Office of the Press Secretary, April 22, 2009 -- http://www.whitehouse.gov/the_press_office/Clean-Energy-Economy-Fact-Sheet/

27 April 2009 – Energy Frontier Research Centers: In April the White House announced that the U.S. Department of Energy, Office of Science will invest $777 million in Energy Frontier Research Centers (EFRCs) over the next five years. In an effort to accelerate scientific breakthroughs needed to build the 21st century energy economy, 46 new EFRCs, selected from approximately 260 applications, will be established at universities, national laboratories, nonprofit organizations, and private firms. The EFRCs, supported in part by funds from the American Recovery and Reinvestment Act, will bring together groups of scientists to address issues in the fields of solar energy, electricity storage, materials science, biofuels, nuclear systems, carbon capture and sequestration. Each EFRC will be funded at $2-5 million per year for five years. The specific areas of research include:

- *Renewable and Carbon-Neutral Energy* (Solar Energy Utilization, Advanced Nuclear Energy Systems, Biofuels, Geological Sequestration of CO_2) -- 20 EFRCs
- *Energy Efficiency* (Clean and Efficient Combustion, Solid State Lighting, Superconductivity) -- 6 EFRCs

- *Energy Storage* (Hydrogen Research, Electrical Energy Storage) --6 EFRCs
- *Crosscutting Science* (Catalysis, Materials under Extreme Environments, other) -- 14 EFRCs

Source: U.S. Department of Energy, Basic Energy Sciences, Basic Research Needs Reports -- http://www.er.doe.gov/bes/reports/list.html

5 May 2009 – Biofuels: Secretary of the U.S. Department of Agriculture (USDA) Tom Vilsack announced that Congress had directed the USDA to make available resources to farmers to determine steps that could be taken to convert to renewable energy sources and move away from reliance on fossil fuels. Vilsack said, "I'm excited about this opportunity because President Obama has directed us to create a comprehensive biofuel marketing development program to focus on the infrastructure necessary for this industry to be a permanent part of the American economy, and to do it in a sustainable way."

Source: "Obama's Biofuel Initiative," Delta Farm Press, 12 May 2009. http://deltafarmpress.com/biofuels/biofuel-initiative-0512/

In response to this announcement, the American Coalition for Ethanol (ACE) praised the President for his comprehensive and bold plan for biofuels. Brian Jennings, executive vice president of ACE, noted that the President's directive "ensures that biofuels will be a part of America's clean energy economy in the future….We also praise President Obama for issuing the first presidential directive of its kind to make biofuel marketing development a priority, including efforts to assist in retail marketing efforts."

Source: American Coalition for Ethanol, "ACE Praises Obama's Visionary Action Plan for Biofuels," *Corn & Soybean Digest*, 5 May 2009 -- http://cornandsoybeandigest.com/biofuels/energy/0505-obama-biofuel-plan-praised/

19 May 2009 – Vehicle Fuel Standards: The President announced new national fuel efficiency standards similar to the rigid guidelines adopted by the State of California.

29 June 2009 – Energy Efficiency: President Obama and U.S. Energy Secretary Steven Chu announced actions to promote energy efficiency and save U.S. consumers billions of dollars annually. "One of the fastest, easiest, and cheapest ways to make our economy stronger and cleaner is to make our economy more energy efficient," said President Obama. "That's why we made energy efficiency investments a focal point of the Recovery Act. And that's why today's announcements are so important. By bringing more energy efficient technologies to American homes and businesses, we won't just significantly reduce our energy demand; we'll put more money back in the pockets of hardworking Americans."

The President and Secretary Chu announced several new energy initiatives:

- More energy efficient lighting – In February 2009, the President tasked the Department of Energy with quickening the pace of energy conservation standards for appliances. The June 29th announcement sets a 2012 goal to achieve standards set for General Service Fluorescent Lamps (GSFL), which are found in residential and commercial buildings, and Incandescent Reflector Lamps (IRL) used in recessed lighting. See: the Office of Energy Efficiency and Renewable Energy Web site: http://www1.eere.energy.gov/buildings/appliance_standards/residential/incandescent_lamps.html

- Building efficiency – President Obama and Secretary Chu announced a $346 million investment from the American Recovery and Reinvestment Act to expand and accelerate the development, deployment, and use of energy efficient technologies in all major types of commercial buildings, as well as new and existing homes. Since residential and commercial buildings consume 40 percent of the energy and represent 40 percent of the carbon emissions in the U.S., building efficiency represents one of the easiest and most cost effective ways to reduce carbon emissions while creating new jobs. Innovations in energy-efficient building envelopes, equipment, lighting, and windows, in conjunction with passive solar, photovoltaic, fuel cells, and advanced sensors could prove to transform today's buildings.

  Funding in this sector includes:

  - Advanced Building Systems Research ($100 million) – These projects focus on systems design, integration, and control of both new and existing buildings and will move beyond component-only driven research and address the interactions in buildings as a whole.
  - Residential Buildings Development and Deployment ($70 million) – Work in residential buildings is intended to increase homeowner energy savings by supporting energy efficient retrofits and new homes while raising consumer awareness of the benefits of increased health, safety, and durability of energy efficiency. Projects will provide technical support to train workers and create jobs, thereby developing a new workforce equipped to improve the nation's homes.
  - Commercial Buildings Initiative ($53.5 million) – These funds will be used to accelerate and expand partnerships with major companies that design, build, own, manage, or operate large fleets of buildings and that commit to achieving exemplary energy performance.
  - Buildings and Appliance Market Transformation ($72.5 million) – In order to achieve energy savings and the development of zero-energy buildings, Secretary Chu said that the marketplace must be conditioned to accept the necessary advanced technologies and activities. The program will expand ENERGY STAR to accelerate the development of energy efficient products; preparing the design, construction, and enforcement community to implement commercial building energy codes that require a 30 percent improvement in efficiency over the 2004 code by 2010; and accelerate the Department of Energy's appliance standards program to evaluate innovative technologies.

- Solid State Lighting Research and Development ($50 million) – This program seeks to advance state-of-the-art solid-state lighting (SSL) technology and to move those advancements more rapidly to market. Such advances can help to create a U.S.-led market for high efficiency light sources that save more energy, reduce costs, and have less environmental impact than other conventional light sources.

For more information about these and other funding opportunities, consult the DOE Recovery Act Funding Opportunities Web page. [http://www.energy.gov/recovery/funding.htm

Public Response to the Obama Energy Policy

Since the President made energy a central part of his administration's policy, the press has been assessing the public's views on that policy. A poll conducted by the *Washington Post* and ABC News on 28 August 2009 showed that:

55% favor the way the President is handling energy policy
52% support the cap-and-trade system of controlling greenhouse gases.

The public also seems to agree that the U.S. needs to address global warming as a man-made phenomenon:

90% support solar and wind energy as viable alternative sources
52% support nuclear power

U.S. CLEAN ENERGY POLICIES

1. American Clean Energy and Security Act (Waxman-Markey Act)

[Note: This report on the Waxman-Markey Act was prepared by Dr. John Clark and submitted to MKE in July 2009.]

The **American Clean Energy and Security Act of 2009** (ACES) or HR 2454 is the most significant energy bill ever passed by the United States Congress. The bill is also known as **Waxman-Markey**, after its authors, Democratic Representatives Henry Waxman of California (chairman of the Energy and Commerce Committee) and Edward Markey of Massachusetts (the chairman of the Energy and Commerce Committee's Energy and Environment Subcommittee).Its most widely discussed component was establishing a variant of a cap-and-trade plan for greenhouse gases that contribute to human-induced climate change. The bill was approved by the House of Representatives on June 26, 2009, by a narrow vote of 219-212, but has not yet been approved by the Senate.

This preliminary report focuses on the content of ACES. Although it will change in many ways before it is finally signed into law by the President — and it is possible that it will not be passed this year — the version of ACES passed June 26 will provide the framework for subsequent discussions of US clean energy policy. This report focuses on what was adopted rather than assessing how effective the policies will be in achieving goals such as reducing emissions of greenhouse gases or positioning the US as a leader in exporting green technologies and products. These and other topics will be more fully addressed in this study's final report.

As should be expected from any piece of American legislation that is this complex (the final version of the bill was 1,428 pages long, including more than 300 pages of amendments inserted by Rep. Waxman minutes before voting on the bill began) and this ambitious, politics was crucial. Think of one of the most important variables as "the political geography of carbon in America."[i]

The place to start is with the bill's centerpiece, a full-fledged cap-and-trade program for greenhouse gas reduction.

Summary and Assessment of the American Clean Energy and Security Act

What is capped in ACES's "Cap-and-Trade"?

ACES caps emissions of greenhouse gases (GHG), requiring high-emitting industries to reduce their output to specific targets between now and the middle of the century.[ii] The bill covers 85 percent of the overall economy, including: large stationary sources emitting more than 25,000 tons per year of GHGs, producers (i.e., refineries) and importers of all petroleum fuels, distributors of natural gas to residential, commercial and small industrial users (i.e., local gas distribution companies), producers of "F-gases" (highly fluorinated gases used as refrigerants that are particularly potent contributors to climate change), and other specified sources. The proposal also calls for regulations to limit black carbon emissions in the United States. The Congressional Budget Office estimates that the bill affects about 7,400 businesses, most

operating upstream in the energy economy where carbon from fossil fuels first enters. [iii] Thus it does not regulate individual consumers, small businesses, farms, and ranches.

Emission cuts would start in 2012, starting with electricity and oil in 2012 and growing to include industrial emitters in 2014 and natural gas in 2016. The cap-and-trade program would be completely phased in by 2016. The goals for U.S. emission reductions, below 2005 levels:

- 3 percent cut by 2012
- 17 percent cut by 2020
- 42 percent cut by 2030
- 83 percent cut by 2050

What is covered? ACES seeks to cap seven greenhouse gases (GHGs): carbon dioxide (CO2); methane (CH4); nitrous oxide (N2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); sulfur hexafluoride (SF6); nitrogen trifluoride (NF3). Supporters of the bill as it was passed as well as those who wish Congress had been more ambitious agree that it targets the correct GHGs. Some wish the targeted emission levels were cut more sharply, but the goals are consistent with President Obama's positions dating back to his candidacy. In fact, the 17 percent cut by 2020 was greater than the 14 percent President Obama proposed.

What is traded as part of the "Cap-and-Trade"

ACES provides new powers to the Federal Energy Regulatory Commission and the Commodity Futures Trading Commission to provide for oversight and regulation of the new markets for carbon allowances. The Commodity Futures Trading Commission has responsibility for regulation and oversight of any derivatives markets unless the President decides otherwise. The bill also prohibits over- the- counter trading of derivatives. "Derivatives" is not a popular word in the current American policymaking vocabulary. Thus a populist criticism of this part of the bill:

> The government-regulated trade of carbon dioxide (CO2) requires a complex system, which opens the door to manipulation by Wall Street opportunists. Emissions trading could drive the creation of risky financial tools like the derivates, hedges, credit default swaps that led to our recent economic crisis and the scandals associated with it.[iv]

As in any cap-and-trade system, regulated industries will need to acquire permits for their emissions. If a company cuts its emissions and has more permits than it needs, it can sell its excess permits to other companies, or bank them for future use. If a company doesn't have enough permits, it can buy more or borrow its future credits and pay interest on them. Non-regulated entities (banks, nonprofits, individuals) can also buy and sell permits. A company's emissions exceeding its permits means being fined two times the fair market value of the permits it should have purchased.

President Obama initially called for all of the permits to be auctioned, with the proceeds for the auction used to provide tax cuts and other assistance to low- and middle-income families.[v] Energy producers and other businesses argued that paying for permits would be a very harsh financial burden. ACES came up with a very different result than the President's goal of 100 percent auctioned permits, and the large majority of permits are allocated to a wide array of entities for free.

About 85 percent of emission permits would be given away free at the start of the program, with the percentage decreasing over time. The recipients of these free permits and the strings attached to the permits were subjects of intense negotiation, and regulated industries are not the only entities to benefit from this distribution. Examples of recipients and strings:

- 15 percent would be given to energy-intensive industries like iron, steel, cement, and paper until 2025
- 5 percent would be given to merchant coal generators (companies that sell coal-generated electricity to other companies at market prices) and to electricity producers obligated to supply electricity under long-term contracts; the giveaways would be phased out from 2026 through 2030
- 2 percent would be given to oil refineries starting in 2014 and ending in 2026
- 2 percent would be given to electric utilities between 2014 and 2017, and 5 percent thereafter, to cover the costs of deploying carbon capture and sequestration technology

Some of the free permits would be given to entities that are not covered under the bill, which would sell them and use the proceeds for specific purposes. Examples include:

- 30 percent would be given to local electricity distribution companies, with giveaways phased out from 2026 through 2030; the companies, which are generally regulated by states, would be required to use the proceeds to help keep consumer electricity prices low. Payments will be in equal lump-sum payments. Utilities using power from more-polluting fuel sources, such as coal, will get more free permits so their rebates will be higher. Starting in 2026, Waxman-Markey begins cutting checks directly to all legal US residents.
- 10 percent would be given to state governments, which would be required to use the value to support renewable energy, energy efficiency, transportation planning, and transmission projects
- 9 percent would be given to local natural-gas distribution companies, with giveaways phased out from 2026 through 2030; the companies would be required to use the proceeds for energy-efficiency projects and to help keep consumer prices low
- 3 percent would be given to the automobile industry from 2012 and 2017, scaling back to 1 percent through 2025; the value would be used for the development of clean car technologies.

About 15 percent of emission permits would be auctioned off at the start of the program, with the percentage increasing over time to 70 percent by 2030. Though most of the permits are at first given out for free, in many cases the recipients must use the proceeds from the sale of the permits to benefit consumers through rebates and other public programs. In the years lead ng up to 2025, some 55 percent or more of permits will go to easing the burden of energy prices.

How will money from the auctioning of permits be spent? Here's how the revenue from the 15 percent of the pollution permits sold by the federal government in the initial years of the program would be spent (shown as a percentage of the value of *all* permits):

- 15 percent would be used to offset increased energy costs for low- and moderate-income households

- 5 percent would be used to prevent international deforestation, scaling back to 3 percent from 2026 to 2030 and 2 percent from 2031 to 2050
- 2 percent would be used to help the U.S. adapt to the negative effects of climate change from 2012 through 2021, scaling up to 4 percent from 2022 through 2026 and 8 percent thereafter; half would be spent on wildlife and natural resources and the other half on other adaptation concerns, like public health
- 1.5 percent would be used to support research and development of advanced clean-energy and energy-efficiency technologies
- 1 percent would go to help other nations adapt to climate change from 2012 through 2021, scaling up to 4 percent from 2027 to 2050
- 1 percent would go to international clean-technology deployment from 2012 to 2021, scaling up to 4 percent from 2027 to 2050
- 0.5 percent would be used to help U.S. workers transition away from fossil fuel-dependent industries from 2012 through 2021, scaling up to 1 percent from 2022 to 2050

Robert Stavins, Harvard University's top environmental economist, estimates that 20 percent of the financial value of carbon permits will accrue to regulated entities, that is to the refineries and power plants; 80 percent of the allowance values will go to consumers, small businesses, and other public purposes.[vi] These permits will be valuable assets. According to preliminary estimates by the Environmental Protection Agency, a permit to emit one ton of carbon dioxide or its equivalent would be worth about $11 to $15 (in 2005 dollars) in 2012; a permit would be worth about $22 to $28 (in 2005 dollars) in 2025. The value of all permits would be about $60 billion in 2012; the value of all permits would be roughly $113 billion in 2025.

Perhaps even more controversial than giving away rather than auctioning carbon permits has been the high levels of international and domestic carbon offsets that can be purchased instead of domestic carbon emission reductions. Funding clean-energy projects elsewhere instead of cutting their own emissions could lower the cost of complying with the new law. Offsets could account for up to 2 billion tons of total emission reductions each year under the entire cap, with about a billion tons for international offsets and about a billion tons for domestic offsets; if there are not enough offsets available on the U.S. market, up to three-quarters could come from international sources, although the two billion annual total still applies. The President can recommend to Congress that the limits on offsets should be increased or decreased. For international offsets, beginning in 2018, 1.25 offset credits would be required to be surrendered for each ton of emissions compliance, but there is no such discount for domestic offsets.

To reassure critics that fear offsets would be used as loopholes to avoid reducing carbon emissions, the EPA will determine eligible offset projects based on recommendations from an Offsets Integrity Advisory Board … but many critics remain skeptical of how this will work in practice.[vii]

Clean, renewable energy quotas for states (i.e. for utilities)

Under the bill's combined Renewable Electricity Standard (RES) and Energy Efficiency Resource Standard (EERS), large utilities in each state must produce an increasing percentage of their electricity from renewable sources. Qualifying renewable sources are wind, solar, geothermal, biomass, marine and hydrokinetic energy, biogas and biofuels derived exclusively

from eligible biomass, landfill gas, wastewater-treatment gas, coal-mine methane, hydropower projects built after 1992, and some waste-to-energy projects. Excluded are nuclear plants.

- Requires 6% of electricity to come from renewables by 2012
- Requires 20% of electricity to come from renewables by 2020
- Up to 5% can actually come from efficiency improvements
- If a state determines that its utilities cannot meet the target, the Federal Energy Regulatory Commission can allow the efficiency component to be increased to 8% and the renewable component decreased to 12%

Utilities receive credit for some resources that are not genuinely either renewable or efficiency. Utilities also receive credit for using coal mine methane and municipal solid waste.

Interaction with regional and state cap-and-trade programs

Even before the federal government adopted a cap-and-trade policy, state governments were taking action. This bill recognizes that cap-and-trade programs have already begun in the US and North America more broadly. The most important examples include the Regional Greenhouse Gas Initiative (RGGI) in the Northeast, the Midwest Greenhouse Gas Reduction Accord (MGGRA), and the Western Climate Initiative (WCI) in the western halves of Canada and the US. Combined these programs cover about half the population of North America.[viii] ACES does allow states to impose more stringent controls on greenhouses gases than is provided by the federal law … except for regional and state cap-and-trade programs, which will be put on hold from 2012-2017 in order to allow the federal cap-and-trade program to take root. Those who hold carbon allowances from the regional programs will be permitted to exchange them for federal allowances before 2012.

Building retrofits and emissions limits, and other efficiency savings.

Because buildings account for most of the electricity consumption in the United States, when indirect power plant emissions are included the energy used in buildings is responsible for more than 40% of greenhouse gas emissions. ACES provides new authority to the Department of Energy (DOE) to establish the first enforceable national building codes that will reduce energy use by 30 percent within a year of enactment of ACES; will reduce energy use by 50 percent by 2015 for homes and 2016 for commercial buildings; and reduce energy use another 5 percent every three years in subsequent years.

ACES specifies a schedule for new building codes that would cut energy consumption in new buildings in half within the next seven years compared to the current industry standards. ACES creates financial incentives to encourage states to adopt and enforce the codes. After a phase-in, ACES withholds 100% of all emissions allowances and funding to states that fail to adopt and enforce the building code standard, as certified by DOE. ACES also provides DOE with authority to federally enforce codes wherever states and local governments both fail to act. ACES devotes 0.5 percent of allowances starting in 2012 to states for building code enforcement, which will help encourage state participation in the program.

Carbon emission allowances from the cap-and-trade program have been set aside to fund The State Energy and Environmental Development (SEED) programs that support state efforts on energy efficiency and renewable energy.[ix] Funding can be used for:

- The Retrofit for Energy and Environmental Performance (REEP) program established by ACES to provide incentives to improve energy efficiency and water efficiency by retrofitting homes and office buildings. REEP allows a maximum incentive that is tied to total energy savings (for example, a maximum of $2,000 for home retrofit measures specified in an audit to achieve energy savings of 20%; and a maximum of $5,000 for measures that have been demonstrated to reduce energy use by 40%).
- The Low-Income Community Energy Efficiency Program, which helps nonprofit community development organizations to provide energy efficiency services and clean energy supplies to low-income residents of urban and rural communities.
- Renewable energy programs
- Developing transportation plans to meet the Act's pollution reduction goals through public transport, teleworking, reducing vehicle idling, bicycle- and pedestrian friendly infrastructure, etc.
- Developing the Smart Grid for public buildings and facilities

Supporters of the bill commend these measures for fostering public-private-nonprofit partnerships at the local level; critics see the federalization of building standards as another encroachment of the national government on the powers and responsibilities of state and local authorities. In addition to mandating more efficient building design and construction, ACES imposes new energy efficiency standards for manufacturing electrical lighting, commercial furnaces, and other appliances. It allows the EPA to promulgate carbon emissions standards for heavy-duty and off-road vehicles, construction equipment, trains, and large ships. ACES creates a regional planning process to encourage more transportation-related energy efficiency savings.

Coal-fired power plants

Critics of ACES are disturbed by what they see as concessions to the coal industry. On the other hand, passage of the bill would not have been possible without support from members of Congress hailing from coal-fueled states.

- New coal plants could be built between 2009 and 2020, though they would be expected to adopt carbon-capture-and-sequestration (CCS) technologies when they become commercially available
- By 2025, all coal plants built after 2009 would have to capture 50 percent of their CO2 emissions
- Coal plants built after 2020 would have to capture 65 percent of CO2
- Early movers on CCS would be rewarded—for every ton of CO2 it sequesters, an electric utility that gets at least half its power from coal would receive bonus emission permits for 10 years
- $1 billion would go toward CCS demonstration and deployment each year, funded by a fee on consumers of fossil-based electricity

ACES replaces potential broad authority under the Clean Air Act to regulate greenhouse gases for new power plants and other large sources with specific performance standards for new coal-fired power plants that received their permit after January 1, 2009. These plants must reduce their emissions between 50-65% (depending on permitting year) when coal capture and storage technology is demonstrated at scale (and no later than 2025). ACES also gives EPA authority to

reduce the emissions rate for new coal-fired plants to reflect the best system of emission reduction that has been "adequately demonstrated."

This will likely be an area of contention when the US Senate debates its version of this bill.

Allocation of bureaucratic authority in ACES

Supporters of ACES commend the expansion of authority granted to the Environmental Protection Agency, which saw many of its powers cut back during the previous Administration. Examples of new authority granted to the EPA include:

- Establish new greenhouse gas emission standards to the level of greatest degree of emission reductions achievable for new heavy duty trucks (2010), airplanes (2012), non-road vehicles such as construction equipment (2012), locomotives (2012), and large marine vessels (2012).
- Set greenhouse gas emission standards for industrial facilities that emit more than 10,000 tons of greenhouse gases annually and are not covered by the cap.
- Establish standardized methodologies that ensure offsets are only available for types of projects that are scientifically assessed to reduce carbon emissions or sequester carbon, and to ensure offsets are additional, verifiable, and permanent. EPA is required to conduct ongoing random audits of offset projects. EPA can revise offset eligible offset projects at any time. Offsets Integrity Advisory Board that reviews the system over time and recommends changes to EPA to "ensure that offset credits issued by the Administrator do not compromise the integrity of the annual emission reductions."
- New authority to regulate black carbon, a pollutant that has not been previously addressed in climate agreements but is increasingly recognized as a contributor to warming, particularly in the Arctic.
- Authority to identify additional greenhouse gases and incorporate them in the emissions control program over time to keep pace with evolving scientific understanding.
- Authority under the Clean Water Act to ensure the environmental integrity of geologic sequestration (underground storage) of carbon, an important step to provide a safe framework for allowing exploration of technologies that capture CO2 carbon emissions from power plants or other large emitters before they reach the atmosphere.
- Starting in July of 2013 and immediately following every presidential election (every 4 years) thereafter, EPA is directed to conduct scientific reviews, including the latest science on potential impacts of global warming and an analysis of U.S. and worldwide efforts to reduce greenhouse gas emissions.

A political compromise deemed necessary to win passage of the bill through Congress was to shift some of the EPA's powers and responsibilities to the Department of Agriculture. Farming interests care deeply about many aspects of minimizing global climate change: livestock produce large quantities of the greenhouse gas methane, expanding farms may require clearing forest and their carbon absorbing trees, and many farmers benefit from subsidies for producing grain for ethanol and from the higher resulting price for their crops in general. The Department of Agriculture rather than the EPA has authority over approving carbon offsets for domestic farms and forests. This leads some to worry that offsets will be regulated by an agency that is captive to the agribusiness interests that it is supposed to regulate. This will be a source of controversy when the U.S. Senate debates its version of this bill.[x]

International implications of ACES

The American Clean Energy and Security Act is intended by the Obama Administration and its supporters to establish the leading role of the United States in a global struggle against human induced climate change.[xi] Looking backward, ACES is meant to differentiate the current Administration from its predecessor, which withdrew from many multilateral clean energy initiatives (not least of which was the Kyoto Protocol). Looking ahead, the measure is meant to strengthen the negotiating position of the US in December's Copenhagen Summit, where a successor to Kyoto will be discussed. Thus it is not surprising that the language of ACES itself defines its international ambitions: "Nations of the world look to the United States for leadership in addressing the threat of and harm from global warming. Full implementation of the [Act] is critical to engage other nations in an international effort to mitigate the threat of and harm from global warming." The bill also places American obligations within a multilateral framework: "It is the policy of the United States to work proactively under the United Nations Framework Convention on Climate Change, and in other appropriate forums, to establish binding agreements, including sectoral agreements, committing all major greenhouse gas-emitting nations to contribute equitably to the reduction of global greenhouse gas emissions."[xii]

One international aspect of ACES is in encouraging and funding developing countries' efforts to address energy policy priorities. One of the obstacles to the US adopting a binding clean energy strategy has been fears by American producers that developing economies — most notably China and India, others as well — that are not similarly bound will have an unfair competitive advantage. Bringing developing countries into a global framework could allay this concern by important American political and economic interests.

As has been seen above, targeting carbon allowances from the cap-and-trade program is one way to achieve these goals. Through 2025, 5 percent of the carbon allowances will be used to fund prevention of tropical deforestation; over time these allowances will be shifted toward adoption of clean energy technology and practices by developing economies. Another incentive to American businesses is that poorer countries will be markets for US energy technologies and services. So in addition to the forestry program, carbon allowances are provided to In addition to the forestry program, allowances are distributed to: export clean technology and develop global markets for U.S. clean technology; and provide international adaptation assistance to help developing nations prepare for the impacts of climate change, which will most severely impact the world's poor.

Another international aspect of ACES is an effort to eliminate any trade advantages that might discourage countries from taking steps to aggressively reduce greenhouse gas emissions. Early in the program, ACES provides emission allowance rebates to help U.S. energy-intensive businesses (such as iron, steel, cement, paper, and glass) maintain their competitiveness with industry in nations that do not yet have carbon caps. If by 2022 a large share of any global product (for example, steel) is being produced by nations who don't have sufficient programs to reduce emissions from that sector or otherwise level the playing field, the president has authority to require that emission allowances be purchased for imports of those products into the U.S. (starting in 2025). The Senate discussion of its version of the bill will address trade implications of US energy policy. Some would like to adopt a sort of carbon tariff on imports to the US of products from countries that have not taken adequate binding measure to deal with greenhouse gases, and/or goods produced by carbon-intensive manufacturing. President Obama has warned

that clean energy policies should not be an excuse for American protectionism. An important part of this discussion would concern obligations and limitations under the World Trade Organization and free trade agreements that US has signed with other countries.

What lies ahead?

The U.S. Senate must pass its own version of the American Clean Energy and Security Act, then must reconcile any changes with the version just passed by the House of representatives.[xiii] With 60 votes of the 100 Senators, the Democrats would appear to have a strong advantage. But it may require 60 votes to bring the measure to a vote, and some Democratic Senators have expressed strong reservations about possible legislation. Six different committees will hold hearings about the Senate bill, which offers opponents several opportunities to block particular measures. In many ways the "political geography of carbon" in the Senate gives the states that are particularly dependent on coal for electricity and on agriculture even more clout than those states have in Congress. In addition to easing pressures on coal and agriculture, support for nuclear power will be a contentious issue in the Senate.

It is not certain that the Senate will vote on this legislation before the Copenhagen Summit. At least as difficult will be passage of President Obama's ambitious plan to transform the American healthcare system. Clean energy could be crowded off the Senate's legislative agenda. On the other hand, the President will not want to go to Copenhagen empty-handed, so it seems likely that his supporters in the Senate will accept less stringent restrictions on greenhouse gases in order to pass a bill. If this happens, reconciliation with the Congress's ACES should not be too difficult, although supporters of strong action to combat global climate change will be disappointed. As the recent G8 Summit and discussions with the Major Economies Forum (MEF) showed, reaching agreement will be very difficult, with or without clean energy legislation passed by both Houses and signed into law by the President.

Themes relevant to Korea's Green Growth Strategy

This preliminary report has been intended to identify the most significant aspects of America's clean energy policies now that they have coalesced through the American Clean Energy and Security Act. Working with Alex Yoon of the Ministry of Knowledge Economy, Sagamore researchers will provide more in-depth analysis and recommendations relevant to Korea's Green Growth Strategy. Now that the U.S. greenhouse gas "cap-and-trade" system is taking shape, it will be easier for Korea to adopt its own carbon capping and market system, replacing the voluntary system now in place.[xiv]

Another issue that should be of interest to the Korean strategy of green growth is funding for clean energy research and transition. These funds are diffused throughout ACES, and could take slightly different shapes as the Senate passes its version. Already American researchers and businesses are exploring what this funding could mean. The state of Indiana possesses two of the nation's leading research universities, Indiana University and Purdue University. Both are deeply involved in clean energy-related research that may develop new technologies that will contribute to a cleaner, more efficient future. In addition, the State of Indiana has embarked upon some ambitious initiatives pertaining to biofuels, new battery technologies, and energy-efficient automobiles that could become a model for industries worldwide.

Notes for American Clean Energy and Security Act

[i]See Michael I. Cragg and Matthew E. Kahn, "Carbon Geography: The Political Economy of Congressional Support for Legislation Intended to Mitigate Greenhouse Gas Production," *NBER Working Paper* no. 14963 (May 2009), at http://mek1966.googlepages.com/w14963.pdf

[ii]Summaries of ACES include: Mark Holt, *Summary of Waxman-Markey Draft Greenhouse Gas Legislation*, Congressional Research Service, May 14 2009, at http://lugar.senate.gov/services/pdf_crs/Summary_of_Waxman-Markey.pdf; Jason Kowalski, *Analysis of H.R. 2454, The Waxman-Markey American Clean Energy and Security Act of 2009 (ACESA)*, June 4 2009, at http://www.1sky.org/files/1Sky-HR2454-Analysis_Update.pdf; *Pew Center Summary of H.R. 2454: The American Clean Energy and Security Act of 2009, as Reported by the Committee* (June 26, 2009), at http://www.pewclimate.org/docUploads/ACES-Act-detailed-summary-06-26-09.pdf.

[iii] The Congressional Budget Office, *Cost Estimate of HR 2454: American Clean Energy and Security Act of 2009*, June 5 2009, at http://www.cbo.gov/ftpdocs/102xx/doc10262/hr2454.pdf

[iv]US Climate Taskforce, "Rebuilding economy and addressing climate change are not mutually exclusive," at http://www.opposingviews.com/arguments/rebuilding-economy-addressing-climate-change-not-mutually-exclusive

[v] See "Barack Obama and Joe Biden: New energy for America," at http://www.barackobama.com/pdf/factsheet_energy_speech_080308.pdf.

[v]i Robert Stavins, "The Wonderful Politics of Cap-and-Trade: A Closer Look at Waxman-Markey," at http://belfercenter.ksg.harvard.edu/analysis/stavins/?p=108

[vii] See Lisa Stiffler, "Offsets: Waxman-Markey's Styrofoam peanuts?" at http://daily.sightline.org/daily_score/archive/2009/06/10/styrofoam-peanuts

[viii] Alan Durning, *Cap and Trade 101: A Federal Climate Policy Primer* (Seattle: Sightline Institute, July 2009), pp. 9-10.

[ix] Alison Pruitt, "Green building provisions in the Waxman-Markey bill," at www.energyboom.com/policy/green-building-provisions-waxman-markey-bill

[x] "The farm lobby vs. the global warming bill," *Los Angeles Times* 26 june 2009, at http://www.latimes.com/news/opinion/la-ed-climate26-2009jun26,0,5647633.story.

[xi]Robert Stavins, "Worried about international competitiveness? Anothre look at the Waxman-Markey cap-and-trade proposal," 18 June 2009, at http://belfercenter.ksg.harvard.edu/analysis/stavins/?p=117.

[xii] Environmental Defense Fund Climate Change Team, "Waxman-Markey: The international provisions," at http://ecosystemmarketplace.com/pages/article.news.php?component_id=6907&component_version_id=10424&language_id=12.

[xiii] Jared Allen, "Rep. Waxman giving Senate room to work on climate change bill," *The Hill* 8 july 2009, at http://thehill.com/leading-the-news/rep.-waxman-giving--senate-room-to-work-on-climate-change-bill-2009-07-08.html; Jennifer Dlouhy, "Energy-climate overhaul an uphill battle in Congress," *Houston Chronicle* 11 July 2009; Peter Roff, "Obama, Reid don't have 60 Senate votes for global warming "cap-and-trade" bill, *US News and World Report* 12 July 2009, at http://www.usnews.com/blogs/peter-roff/2009/07/09/obama-reid-dont-have-60-senate-votes-for-global-warming-cap-and-trade-bill.html.

[xiv] Kim Gyeong-won, "Korea set to create carbon trading market," *Korean Herald* 5 May 2009.

2. The Clean Air Act

www.epa.gov/air/caa/

Legislation to address the issue of air pollution in the U.S. began several decades ago. The first act was the Air Pollution Control Act of 1955, which declared that air pollution was a danger to public health and welfare, but preserved the primary responsibilities of state and local governments in controlling that pollution. That was followed by the Clean Air Act of 1963, which was the first federal legislation regarding air pollution *control.* It established a federal program in the U.S. Public Health Service and authorized research into techniques for monitoring and controlling air pollution. The Air Quality Act of 1967 expanded federal government activities, including monitoring and studying interstate air pollution transport.

The Clean Air Act Extension of 1970 authorized the development of comprehensive federal and state regulations to limit emissions from stationary (industrial) and mobile (vehicles) sources. Two of the key regulatory programs adopted here were the National Ambient Air Quality Standards (NAAQS) and the National Emission Standards for Hazardous Pollutants NESHP). The adoption of this legislation came at the same time as the National Environmental Policy Act, which established the Environmental Protection Agency (EPA). Congress created the EPA on 2 May 1971 in order to implement the requirements included in the Clean Air Act of 1970.

Congress amended the Clean Air Act in 1977 and 1990. Both sets of amendments increased the authority and responsibility of the federal government to monitor air pollution, expanded enforcement authority, and expanded research programs.

For a complete text of the Clean Air Act as of February 2004, see:
http://epw.senate.gov/envlaws/cleanair.pdf

On 30 September 2009, the EPA proposed new regulations that would require power plants, factories, and refineries that emit at least 25,000 tons of greenhouse gases a year to reduce those gases by installing the best available technology and improving energy efficiency whenever a facility is significantly changed or constructed. EPA Administrator Lisa Jackson noted:

> *By using the power and authority of the Clean Air Act, we can begin reducing emissions from the nation's largest greenhouse gas-emitting facilities without placing an undue burden on the businesses that make up the vast majority of our economy. We know the corner coffee shop is no place to look for meaningful carbon reductions.*
>
> [Associated Press, 1 October 2009]

This move was in response to the announcement by the Obama administration earlier in the year that it would start developing the first-ever greenhouse gas emissions standards for cars and trucks. Those regulations, which would take effect in 2010, compel the EPA to control greenhouse gases from large smokestacks as well.

Industry groups, however, immediately questioned the agency's arguments. They claimed that the EPA was singling out larger industries and thus avoiding the content of the Clean Air Act since the law covers any facility releasing more than 250 tons of recognized pollutants per year. Charles T. Drevna, president of the National Petrochemical and Refiners Association, noted,

"This proposal incorrectly assumes that one industry's greenhouse gas emissions are worse than another's." Critics also challenged the legality of the EPA action since it takes an act of Congress to change wording in a statute adopted by Congress.

3. Climate Change

http://www.epa.gov/climatechange/basicinfo.html

Climate change refers to a significant change in measures of climate lasting for an extended period of time. It can result from:

- Natural factors such as changes in the sun's intensity.
- Natural processes within the climate system (e.g. changes in ocean circulation).
- Human activities that alter the composition of the atmosphere (e.g. burning fossil fuels) and the land surface (e.g. deforestation, urbanization).

  Source: U.S. Environmental Protection Agency, http://www.epa.gov/climatechange/basicinfo.html

Beginning in the late 18th century, human activities that became known as the "Industrial Revolution" began to change the composition of the earth's atmosphere. This occurred due to the burning of fossil fuels, such as coal and oil, to power new factories. Scientists have argued in recent decades that the continued growth of industrial societies and use of fossil fuels, coupled with deforestation worldwide, have caused the concentration of heat-trapping "greenhouse gases" to increase in our atmosphere. As a result, these gases prevent heat from escaping, thus acting as glass panels in a greenhouse. Many scientists argue that if greenhouse gases continue to accumulate, the earth's temperature could increase by several degrees over the next century, which will change the overall climate of the planet.

The issue of "climate change," also known as "global warming," has become a hot topic for debate in recent years. Scientific findings generally conclude that humans contribute heavily to the alteration of the atmosphere and have called for increased regulations on emissions. Skeptics of "global warming" or "climate change" dispute all or some of the scientific evidence and question whether global warming is actually occurring, if human activity is responsible, and if the global threat is as serious as alleged.

In December 1997, nations meetings in Kyoto, Japan, drafted the Kyoto Protocol, a document of the United Nations Framework Convention on Climate Change. It is an international environmental treaty with the specified goal of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The protocol establishes legally binding commitments for the reduction of greenhouse gases (carbon dioxide, methane, nitrous oxide, sulpher hexafluoride) and two groups of gases (hydrofluorocarbons and perfluorocarbons) produced by industrialized nations. As of January 2009, 183 nations had ratified the protocol. The U.S. has neither ratified nor withdrawn from the protocol. Prior to the finalization of the protocol, the U.S. Senate voted 95-0 to oppose signing any protocol that did not include binding targets and timetables for developing nations as well as the industrialized nations.

Despite the debate, there appears to be a growing sense of urgency to take action in some form of policies to reduce CO_2 emissions. On 22 September 2009, world leaders called for immediate and substantive steps to combat climate change, noting that the failure to act now could bring "irreversible catastrophe." Speaking to a special summit on climate change at the United Nations, President Obama pledged the full commitment of the U.S. to a growing global call for action after what he called years of not responding to the challenges.

Source: United Nations Framework Convention on Climate Change, http://unfccc.int/essential_background/convention/background/items/1353.php; Kyoto Protocol, http://en.wikipedia.org/wiki/Kyoto_Protocol#United_States]

Where does the U.S. stand on climate change policy? The Federal government is using voluntary and incentive-based programs to seek a reduction in emissions and has established programs to promote climate technology and science. It seeks to use the expertise of Federal agencies and the power of the private sector to address the problem.

The Environmental Protection Agency (EPA) takes the lead in helping the Federal government to reduce greenhouse gas emissions. They have adopted many initiatives, such as ENERGY STAR, Climate Leaders, and the Methane Voluntary Program, to encourage voluntary emission reductions from corporations, consumers, commercial buildings, and the industrial sector.

- Current and Near-Term Greenhouse Gas Reduction Initiatives: The Federal government administers a wide array of public-private partnerships to reduce greenhouse gas emissions in the U.S. They focus on energy efficiency, renewable energy, agricultural practices, and implementation of new technologies to achieve reduction in greenhouse gases.

    1. The **Clean Energy-Environment State Partnership** is a voluntary state-federal partnership that encourages states to develop and implement cost-effective clean energy and environmental strategies. These strategies help further both environmental and clean energy goals while achieving public health and economic benefits. [http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-partnership.html]

    2. **Climate Leaders** is an EPA industry-government partnership that works with companies to develop comprehensive climate change strategies. Partner companies commit to reducing their impact on the global environment by setting aggressive greenhouse gas reduction goals. By participating in the program, companies receive recognition from the EPA as corporate environmental leaders. [http://www.epa.gov/climateleaders/]

    3. **Combined Heat and Power Partnership (CHP)** is a voluntary program to reduce the environmental impact of power generation by promoting the use of CHP, which is an efficient, clean and reliable approach to generating power and thermal energy from a single fuel source. [http://www.epa.gov/chp/index.html]

4. **ENERGY STAR,** introduced by the EPA in 1992, is a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Today, more than 1,400 manufacturers use the ENERGY STAR logo in more than 40 product categories. [http://www.energystar.gov/ ; http://www.epa.gov/appdstar/pdf/CPPD2004.pdf]

5. The **EPA Office of Transportation and Air Quality Voluntary Programs** aims to reduce pollution and improve air quality by means of forming partnerships with small and large businesses, citizen groups, industries, trade associations, and state and local governments. Programs include a National Clean Diesel Campaign, the SmartWay Transport Partnership, Clean School Bus USA, and Best Workplaces for Commuters to address efforts to reduce emissions in vehicles. [http://www.epa.gov/otaq/voluntary.htm]

6. The **Green Power Partnership** is a voluntary partnership between EPA and organizations that are interested in purchasing green power – an environmentally friendly electricity product that is generated from renewable energy sources. Through this program, the EPA supports organizations that are buying or planning to buy green power. [http://www.epa.gov/greenpower/index.htm]

7. **High GWP Gas Voluntary Programs** is an effort to reduce U.S. emissions of high global warming potential (GWP) gasses usually generated as byproducts of industrial operations, primarily aluminum smelters, semiconductor manufacturers, electric power companies, and magnesium smelters and die-casters. [http://www.epa.gov/highgwp/voluntary.html]

8. **Methane Voluntary Programs** are collaborative efforts designed to reduce methane emissions that occur in the coal, natural gas, petroleum, landfill, and agricultural industries. [http://www.epa.gov/outreach/voluntary.html]

9. **WasteWise** is a voluntary program through which organizations reduce and/or recycle costly municipal solid waste and select industrial wastes. It encourages program partners to design their own waste reduction programs. [http://www.epa.gov/epawaste/partnerships/wastewise/index.htm]

- Climate Change Technology Program: The Federal government established this multi-agency program in 2002 to promote and accelerate the development and deployment of new climate change technologies. The program provides direction and organizes about $3 billion in federal spending for climate change-related technology research, development, demonstration, and deployment. [http://www.epa.gov/climatechange/policy/cctp.html]

  For more details, se the CCTP strategic plan:
  http://www.climatetechnology.gov/stratplan/draft/CCTP-SratPlan-Sept-2005.pdf

- Climate Change Science Program: In 2002, the U.S. government announced a climate change research initiative to focus on key remaining gaps in climate change science. This science program was established to investigate natural and human-induced changes in the global environmental system; to monitor and predict global changes; and to provide a sound scientific basis for decision-making.
  [http://www.epa.gov/climatechange/policy/ccsp.html]

For more information about U.S. Greenhouse Gas emissions, see the 2009 U.S. Greenhouse Gas Inventory Report --
http://www.epa.gov/climatechange/emissions/downloads09/InventoryUSGhG1990-2007.pdf

What are the possible impacts of new climate change policies?

1. More research and funding – Researchers in academia, government, and the private sector might find new available funds for research on climate change.
2. More corporate profits – Some corporations could benefit from new laws and regulations to control CO2 emissions since they might have an advantage over their competitors. Many companies have already worked to address this issue – whether through the use of renewable energy, using carbon credits, or retiring older facilities, which gives them a distinct advantage over those companies that have yet to implement similar programs.
3. More global competition – Many European nations already have laws that regulate carbon emissions. If the U.S. adopts new emission policies, that would provide a level playing field for business worldwide.

Where Should We Go From Here?

Present concerns regarding climate issues require responsible, objective, and scientific analysis. We must acknowledge that there is no magic silver bullet in renewable sources, biofuels, and new technologies to solve all of the problems. The process of addressing future energy needs and the environment will require the development of a broader energy portfolio that includes new sources and which recognizes the specific limitations of each. A broad portfolio should promote energy security by reducing dependence upon a single source. It should also stimulate the economy since it will also promote competition in the pursuit of new technologies designed to meet future energy needs.

While the ideas for new energy sources are attractive, they will likely not meet our near term energy needs. As described earlier in this report, fossil fuels provide approximately 86 percent of our current energy supply, and the Department of Energy anticipates that fossil fuels will continue to provide a similar portion of our supply for decades to come. Furthermore, there are huge energy resources that have yet to be tapped, which could improve America's energy security significantly if tapped.

The Institute for Energy Research offers an interesting conclusion here:

> *The path ahead is forked. Choosing the responsible path to meet our energy and climate challenges requires making decisions based on solid facts. There must be an honest discussion and accurate understanding of these issues including many that have been absent in the current public discourse. Of the forks we could choose, one is a perilous course where the past push for constricting energy and the actions that have done so merge with rashly enacted CO2 policies and rumble along on a downhill trajectory. Rejecting this course and choosing the responsible path will still require meeting significant challenges but none are insurmountable. Perhaps the greatest challenge we face is tuning out the hype and mustering the will to take the right path.*
>
> Source: "Climate Change: Overview," Institute for Energy Research, http://www.instituteforenergyresearch.org/climate-change/climate-change-overview/

4. Clean Energy Programs

There is growing interest in investing in clean energy, which includes energy efficiency and clean energy supply options such as renewable energy sources and combined heat and power. The EPA's Clean Energy Programs are working with state policy makers, electric and gas utilities, customers, and other stakeholders to identify solutions and adopt policies that will benefit the environment and the economy.

- Clean Cities Program: Clean Cities is a public-private partnership sponsored by the U.S. Department of Energy's (DOE) Vehicle Technologies Program. It works with local coalitions and thousands of stakeholders to reduce petroleum consumption in the transportation sector. Its goal is to expand and stimulate alternative fuel and advanced technology markets to reduce petroleum consumption by 2.5 billion gallons by 2020.

  Clean Cities advances the energy, economic, and environmental security of the U.S. by supporting local decisions to adopt practices that reduce the use of petroleum in the transportation sector. Program coordinators lead local geographically-based coalitions composed of local fleets, fuel providers, and decision-makers that focus on a common goal of petroleum reduction. There are nearly 90 coalitions representing 229 million U.S. citizens—approximately 78% of the country's total population. Since its inception in 1993, the Clean Cities program estimates that its stakeholders have displaced more than 2 billion gallons of petroleum.
  [http://www.afdc.energy.gov/cleancities/progs/coalition_locations.php]

  Clean Cities focuses on three primary methods to achieve this goal:

  - **Replacement:** Replacing petroleum used in the transportation sector with alternative fuels and low-level blends of non-petroleum replacement fuels.
  - **Reduction:** Reducing petroleum use by promoting energy efficiency in vehicles through advanced technology and efficient vehicles.

- **Elimination:** Eliminating petroleum or other fuel use by promoting advanced technologies and greater use of mass transit systems, trip elimination measures, and other congestion mitigation approaches.

While initially focused solely on alternative fuels, Clean Cities has expanded to include other relevant technologies, including:

- Alternative fuels and vehicles
- Hybrid electric vehicles
- Idle reduction technologies
- Fuel economy measures
- Low-level fuel blends

The local coalitions work on increasing the number of alternative fuel vehicles (AFVs) on American roads. They also play a key role in the growth of the alternative fuel infrastructure across the country. The Clean Cities program tracks this growth on the Station Locator and Route Mapper tool, which is located on the Alternative Fuels and Advanced Vehicles Data Center Web site. Today, the number of U.S. alternative fueling stations tops 5,700, with gains averaging 15 percent in recent years.
[U.S. Department of Energy, http://www.afdc.energy.gov/afdc/fuels/stations.html]

- Clean Coal: Clean coal is a term used to describe new technologies that may reduce sharply the air emissions and other pollutants from coal-burning power plants.

  Early initiatives focused on concerns over the impact of acid rain on forests and watersheds. In the 21st century, additional concerns include the potential health impacts of trace emissions of mercury, the effects of microscopic particles, and the potential impact of greenhouse gases.

  Given that coal will likely remain one of the nation's best and lowest-cost electric power source for the future, the Clean Coal Power Initiative provides financing for new technologies that can assist utilities in cutting sulfur, nitrogen, and mercury pollutants. The intent is to reduce greenhouse emissions by boosting the efficiency by which coal plants convert coal to electricity or other energy forms. Its long-term vision is to create "an energy-secure America that can tap the full potential of all its energy resources, including coal."
  [Clean Coal Strategic Plan,
  http://fossil.energy.gov/programs/powersystems/publications/OCC_Strategic_Plan_external_Sept06.pdf]

  The coal industry has touted clean coal in an effort to counter negative images of coal. It also has dedicated some $500 million towards the development and deployment of clean coal technologies, including carbon capture and storage. (Note: There is not yet a commercial-scale coal-fired power plant in the U.S. that captures and stores more than a small amount of CO_2.)

The world's first "clean coal" power plant went online in September 2008 in Spremberg, Germany. The facility captures CO_2 and acid rain-producing sulfides, separates them, and compresses the CO_2 into a liquid state. The plan is to inject the CO_2 into depleted natural gas fields or other geological formations. Vattenfall, the Swedish utility company that built the pilot plant, has great hopes for clean coal, but regards this process as a bridge to renewable energy technologies rather than a permanent solution to climate change. For more on this initiative, see: "Can Clean Coal Actually Work? Time to Find Out," *Discover Magazine*, February 2009 -- http://discovermagazine.com/2009/feb/25-can-clean-coal-actually-work/?searchterm=clean%20coal

Most recent, the American Recovery and Reinvestment Act of 2009 (Recovery Act) added an additional $800 million to funding for clean coal programming. Details on the program may be found at the Department of Energy Clean Coal Technology Program, http://fossil.energy.gov/programs/powersystems/cleancoal/index.html

5. Hydrogen Program

http://www.hydrogen.energy.gov/ ;
http://www1.eere.energy.gov/hydrogenandfuelcells/production/doe_activities.html **;**
http://fossil.energy.gov/programs/fuels/index.html

The U.S. Department of Energy Hydrogen Program is an initiative in partnership with industry, academia, national laboratories, federal and international agencies to:

- Overcome technical barriers through research and development of hydrogen production, delivery, and storage technologies, as well as fuel cell technologies for transportation, distributed stationary power, and portable power applications.
- Address safety concerns and develop model codes and standards.
- Validate and demonstrate hydrogen and fuel cell technologies in real-world conditions.
- Educate key stakeholders whose acceptance of these technologies will determine their success in the marketplace.

The program seeks to advance cost-effective, efficient production of hydrogen from natural gas, coal, nuclear power, and renewable resources.

- Hydrogen from Coal: The Office of Fossil Energy is sponsoring research on technologies needed to produce hydrogen from coal-derived synthesis gas and to build and operate zero-emissions, high efficiency power plants that will produce hydrogen from coal along with electricity. The goal by the end of 2014 is to make available an alternative hydrogen production pathway for decentralized production of hydrogen from high hydrogen content hydrocarbon liquids and/or substitute natural gas that can be delivered through the existing fuel distribution infrastructure.

  Source: http://fossil.energy.gov/programs/fuels/hydrogen/Hydrogen_from_Coal_R%26D.html ; http://fossil.energy.gov/programs/fuels/hydrogen/High_Hydrogen_Content_Fuels_from_Coal.html

Another goal of this initiative is by 2016 to prove the feasibility of a 60 percent efficient, near-zero emissions, coal-fueled hydrogen and power co-production facility which reduces the cost of hydrogen by 25 percent compared to current coal-based technology.

The principal benefit of producing hydrogen from coal is that the U.S. has an abundant domestic supply of coal – approximately 250 years based on current estimates. By using coal to produce hydrogen for the transportation sector, the nation could reduce its total energy use and particularly its reliance on imported petroleum, all while creating new energy-related jobs in the domestic economy.

The production of hydrogen from coal also offers environmental benefits when integrated with advanced technologies in coal gasification, power production, and carbon sequestration. The integration of these technologies would help to capture multiple pollutants (e.g. sulfur oxides, nitrogen oxides, mercury, and particulates) including greenhouse gases such as carbon dioxide. When hydrogen is used in efficient fuel cell vehicles, emissions from the transportation sector can be nearly eliminated.

- Hydrogen from Nuclear Power: The Office of Nuclear Energy is seeking to develop the commercial-scale production of hydrogen using heat from a nuclear energy system. The U.S. Department of Energy is also collaborating with ten other nations on Generation-IV Nuclear deliberations to develop consensus on research and development for the next phase of nuclear energy. Nuclear engineer David Wade of Argonne Laboratories noted that,

  > *future advanced reactors can provide heat for manufacturing hydrogen. Nuclear energy is the only way we know to generate large amounts of heat, without burning large amounts of fossil fuel. But today's nuclear power plants don't produce enough heat……Transition to a hydrogen economy created by nuclear power could take three or more decades. But, it could provide a clean, abundant and affordable fuel supply for transportation and homes and industry.*
  >
  > Source: "Nuclear plants may be clean hydrogen source," U.S. Department of Energy Research News, http://www.eurekalert.org/features/doe/2004-06/dnl-npm061404.php

- Hydrogen from Renewable Resources: Research by the Energy Efficiency and Renewable Energy program of the U.S. Department of Energy is focusing on the development of technologies to produce hydrogen from domestic renewable energy resources. Key areas of research currently include electrolysis, thermochemical conversion of biomass, photoelectricalchemical systems, and high temperature chemical cycle water splitting.

In 2004, engineers at the University of Minnesota announced that they had invented the first reactor capable of producing hydrogen from a renewable fuel source – ethanol – efficiently enough to have economic potential. Ethanol is already being produced from corn and is used in car engines. But, if it were used to produce hydrogen for a fuel cell, the process would be nearly three times as efficient. Thus, the engineers argue that a bushel of corn would yield three times as much power if the energy were channeled into hydrogen fuel cells rather than burned with gasoline.

Source: *Science*, February 13, 2004; and the University of Minnesota News, http://www1.umn.edu/umnnews/Feature_Stories/Hydrogen_from_renewable_sources_within_reach.html]

Hydrogen that is produced from the methods described above would be stored in a fuel cell – an energy conversion device that captures and uses the power of hydrogen. Hydrogen-powered fuel cells are pollution-free and can have more than twice the efficiency of traditional combustion technologies. The key challenges for the development and commercialization of hydrogen fuel cells is reducing cost and improving durability. Fuel cell systems need to be cost-competitive with, and perform as well or better than, traditional power technologies.

For more information, consult the Hydrogen Fuel Cell Information Sheet -- http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/doe_h2_fuelcell_factsheet.pdf

6. Renewable Energy Policies

http://www.repp.org/

U.S. President Barack Obama has made energy and the environment one of the key priorities of his administration. On 19 March 2009, the President made the following remarks:

> *So we have a choice to make. We can remain one of the world's leading importers of foreign oil, or we can make the investments that would allow us to become the world's leading exporter of renewable energy. We can let climate change continue to go unchecked, or we can help stop it. We can let the jobs of tomorrow be created abroad, or we can create those jobs right here in America and lay the foundation for lasting prosperity.*
>
> Source: The White House, http://www.whitehouse.gov/issues/energy_and_environment/

Given this focus, there are numerous programs that have been proposed and some continued from the previous administrations.

- American Recovery and Reinvestment Act: The American Recovery and Reinvestment Act of 2009 (known as ARRA or the Recovery Act) was enacted by the U.S. Congress in February 2009 and signed into law by President Obama on 17 February 2009. It was intended to provide a stimulus to the U.S. economy in the wake of the economic downturn of the past year. The measure is worth $787 billion and includes federal tax

cuts, expansion of unemployment benefits, and other social welfare provisions, and domestic spending in education, health care, and infrastructure, including the energy sector.

The Recovery Act included more than $80 billion in clean energy investments that are intended to jump-start the American economy and build clean energy jobs for the future. Key appropriations include:

- $11 billion for a larger and smarter grid that will move renewable energy from the rural places it is produced to the cities where it is mostly used, as well as for 40 million smart meters to be deployed in American homes.
- $5 billion for low-income home weatherization projects.
- $4.5 billion to green federal buildings and cut our energy bill, saving taxpayers billions of dollars.
- $6.3 billion for state and local renewable energy and energy efficiency efforts.
- $600 million in green job training programs – $100 million to expand line worker training programs and $500 million for green workforce training.
- $2 billion in competitive grants to develop the next generation of batteries to store energy.

- Fuel Economy Standards: In January 2009, President Obama directed the U.S. Department of Transportation (DOT) to establish higher efficiency standards for carmakers beginning in the 2011 model year. The standard, known as the Corporate Average Fuel Economy (CAFE), was established in 1975 in the wake of the Mideast Oil Embargo.

- Efficiency Standards for Household Appliances: On 5 February 2009, President Obama issued a memorandum to the Secretary of Energy to implement more aggressive efficiency standards for household appliances and commercial products. These standards are intended to result in significant energy savings for the American public. See: http://www.whitehouse.gov/the_press_office/ApplianceEfficiencyStandards/

- Reduction of Mercury Emissions: One month after the President was inaugurated, the U.S. embarked upon an effort to secure international consensus on the reduction of mercury emissions worldwide. The agreement between the U.S. and 40 other nations marked a step forward in protecting human health and the environment from mercury. Achim Steiner, executive director of the U.N. Environmental Program, noted :

  Only a few weeks ago, nations remained divided on how to deal with this major public health threat which touches everyone in every country of the world….Today, the world's environment ministers, armed with the full facts and full choices, decided the time for talking was over – the time for action on this pollution is now.

  See: http://www.whitehouse.gov/blog/09/02/25/Making-Strides-Improving-Standards/

- Renewable Energy on Outer Continental Shelf: On Earth Day 2009, President Obama unveiled a program to develop renewable energy projects on the waters of the Outer Continental Shelf that produce electricity from wind, waves, and ocean currents. The initiative is intended to help the U.S. tap the ocean's sustainable resources to generate clean energy.
  See: http://www.whitehouse.gov/the_press_office/Remarks-by-the-President-in-Newton-IA/

- National Biofuels Action Plan: In an effort to meet President George W. Bush's "Twenty in Ten" goal (e.g. reduction of gasoline consumption by 20 percent over 10 years) and to meet the Renewable Fuel Standard (RFS) targets in the Energy Independence and Security Act of 2007 (EISA), the Biomass Research and Development Board – co-chaired by the U.S. Department of Agriculture (USDA) and the U.S. Department of Energy (DOE) – developed the National Biofuels Action Plan to accelerate the development of a sustainable biofuels industry.

  The Board determined that meeting production targets required interagency collaboration from ten federal agencies and the White House. The Action Plan identifies key research challenges and defines actions that are critical to developing the science and technology to produce the next generation biofuels. Specific areas of action include:

  - **Sustainability:** A working group led by USDA, DOE, and the Environmental Protection Agency (EPA) is defining science-based national criteria, to be established by November 2008, and indicators to assess the sustainability of biofuels production coordinated with ongoing international activities.

  - **Feedstock Production:** A Board-commissioned interagency working group conducted a feedstock availability and cost study using EISA production targets. A separate Board working group is developing a long-term integrated feedstock research and development plan across the federal government, which will reach completion by December 2008.

  - **Feedstock Logistics:** A working group led by USDA will facilitate collaboration to develop and deploy logistics systems that can supply cellulosic feedstocks to demonstration facilities.

  - **Conversion Science and Technology:** A working group composed of DOE, USDA, EPA, National Science Foundation (NSF), and U.S. Department of Defense (DOD) is collaborating to develop a 10-year federal science and technology research plan by December 2008 for developing cost-effective means of biomass conversion and production of cellulosic biofuels.

  - **Distribution Infrastructure:** A U.S. Department of Transportation (DOT)-led group is studying the feasibility of transporting ethanol in pipelines and assessing the availability of geographic information system (GIS) capabilities across agencies.

- **Blending:** The Board has approved a statement on blending ethanol with gasoline in amounts greater than 10 percent (E10) and will review results of an interagency testing program to evaluate the impact of intermediate blends on vehicle emissions and material compatibility by fall 2008.

- **Environment, Health and Safety:** An EPA-led working group is inventorying federal activities and areas of jurisdiction with respect to public health, safety, and environmental protection.

To read the action plan: http://www1.eere.energy.gov/biomass/pdfs/nbap.pdf

- Wind Energy: In 2008, the U.S. Department of Energy published a report that examines the feasibility of expanding wind energy to generate 20 percent of the nation's electricity demand by 2030. The report, "20% Wind Energy by 2030: Increasing Wind Energy's Contributions to the U.S. Electricity Supply," included contributions from DOE, national laboratories, the wind industry, electric utilities, and other groups to examine costs, impacts, and challenges in moving towards the goal if 20 percent wind energy by 2030.

  The report concluded:

  1. Reaching 20 percent wind energy will require enhanced transmission infrastructure, streamlined siting and permitting regimes, improved reliability and operability of wind systems, and increased U.S. wind manufacturing capacity.
  2. Achieving 20 percent will require the number of turbine installations to increase from approximately 2000 per year in 2006 to nearly 7,000 per year in 2017.
  3. Integrating 20 percent wind energy into the grid can be done reliably for less than 0.5 cents per kilowatt hour.
  4. Addressing transmission challenges such as site selection and cost allocation of new transmission lines to access the nation's best wind resources will be required to achieve the 20 percent goal.

  The full report may be found at: http://www1.eere.energy.gov/windandhydro/pdfs/41869.pdf

- Solar Energy: The Solar Energy Technologies Program (SETP) works to develop cost-competitive solar energy systems for the U.S. More than $170 million is spent annually in research and development on two solar electric technologies with the greatest potential for cost effectiveness by 2015: photovoltaics (PV) and concentrating solar power (CSP). The key challenges under this program are reducing costs, improving system performance, and finding new ways to generate and store energy captured from the sun. The program also seeks to have new technology understood by and accepted in the marketplace.

  The program, while designed to work towards new technologies and energy independence for the U.S., also has other benefits for the nation:

- Adding 250,000 new jobs for the U.S. in the solar industry;
- Saving an estimated $100 billion per year for industry and businesses by averting power outages;
- Improving air quality by using a clean, non-polluting fuel source;
- Reducing carbon emissions by an estimated 23 million metric tons per year by 2030.

SETP works with industry, national laboratories, and universities to conduct research and develop new programs. Laboratory partners include: the National Renewable Energy Laboratory, Sandia National Laboratories, Oak Ridge National Laboratory, and Brookhaven National Laboratory.

A full report on the program may be found at:
http://www1.eere.energy.gov/solar/pdfs/fy08_annual_report_43987.pdf

- Nuclear Energy: The Office of Nuclear Energy promotes nuclear power as a resource capable of meeting the nation's energy, environmental, and national security needs.

  The Nuclear Energy Advisory Committee (NEAC) established two subcommittees to develop a report for the incoming Obama administration: the Policy Subcommittee was charged to evaluate current U.S. nuclear energy policy and explore the critical choices and implications of that policy; the Technical Subcommittee was charged to review facilities for nuclear energy programs.

  1. The Policy Subcommittee acknowledged that nuclear power has the potential to curtail the dependence on fossil fuels and reduce the amount of greenhouse gases emitted, and thus should be retained as a key piece of the nation's energy portfolio. The committee concluded that there is substantial risk and uncertainty surrounding the ability and length of time actually required to license and build a nuclear power plant. Reducing this risk and uncertainty for new power plants is the goal of U.S. legislation that authorizes loan guarantees in support of nuclear power plant construction.

     Encouraged by the offer of federal subsidies under the 2005 Energy Policy Act, a number of U.S. utilities are now seriously considering the addition of nuclear power plants to their power generating portfolios.

     The NEAC reviewed a range of projections regarding the future deployment of nuclear power in the U.S. and concluded that the uncertainties regarding numerous issues (e.g. cost, construction time, disposal of nuclear waste, security) precluded any confident judgment regarding the successful deployment of nuclear power.

     The NEAC also recommended that the U.S. Government should develop and articulate its nuclear energy policy to assure a uniform level of excellence that will provide global leadership, assure environmental and energy security, and

protect the nation's prosperity, as well as to build on and extend its commitment to nuclear safety, security and nonproliferation.

NCAE recommends the following steps to be taken by the Obama administration:

a. The establishment and implementation of a nuclear energy research and development roadmap.
b. The development of a workforce able to meet the human resource requirements of the U.S. nuclear industry.
c. Preservation of "safety first" as the guiding principle for all actions regarding the design, construction, and operation of all nuclear facilities.
d. Integration of security as a top priority in U.S. nuclear facilities.
e. Strengthening of the International Atomic Energy Agency (IAEA) and providing it with the resources required to do its job properly in order to promote the safe development of nuclear energy globally.

2. The Technical Subcommittee reviewed facilities available for nuclear energy programs. Among the recommended steps are:

a. Assurance of a well-qualified and trained workforce.
b. Development and demonstration of Generation IV reactors to extend the applications of nuclear energy.
c. The upgrade of domestic facilities and expansion of the collaborative use of international facilities for activities required to create a sustainable fuel cycle.
d. Support international collaboration, especially with respect to longer term, high-cost research and development goals, such as in developing recycling and fast reactor capabilities.
e. Encourage a new cadre of engineers and scientists to work in nuclear energy.
f. Conduct research on nuclear waste management.

The Office of Nuclear Energy concluded that "to terminate our planning horizon at 2030 would be a serious mistake. New concepts can take many decades to go through laboratory-scale and engineering-scale development before getting to commercial scale."

To view the report "Nuclear Energy: Policies and Technology for the 21st Century, "see: http://www.ne.doe.gov/neac/neacPDFs/NEAC_Final_Report_Web%20Version.pdf

To view the Office of Nuclear Energy performance plan, see: http://www.ne.doe.gov/pdfFiles/NEPerformancePlanFY09.pdf

7. Energy Efficiency Programs

There are several new programs focusing on energy efficiency that have been implemented in recent years by the Bush Administration and the Obama Administration.

Building Technologies Program: The Building Technologies Program (BTP) funds research and technology development to reduce commercial and residential building energy use. The program is working to achieve the goal of net-zero energy buildings, which produce as much energy as they consume. BTP works with national laboratories and industry partners to achieve this goal. The strategic goal of this program is to create technologies and design approaches that lead to marketable zero energy homes by 2020 and zero energy commercial buildings by 2025.

BTP also partners with the private sector, state and local governments, national laboratories, and universities to improve the efficiency of buildings and the equipment, components, and systems within them. The program supports research and development activities and provides tools, guidelines, training, and access to technical and financial resources. The U.S. has many opportunities for energy and cost savings in its buildings. BTP is leading the way with advanced technologies and zero energy building design.

The Department of Energy's zero energy research initiative drives the goals of the Building Technologies Program and seeks to develop new concepts for builders and building owners nationwide. Zero energy buildings produce as much energy as they consume over the course of a year. They typically use renewable energy technologies such as solar water heating and solar electricity. To read more about this program, see: http://www1.eere.energy.gov/buildings/about.html

The BTP Multi-Year Program Plan 2008 describes the planned research, development, and demonstration activities for the program. The full plan is available for review at: http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/myp08complete.pdf

Federal Energy Management Program: The Department of Energy's Federal Energy Management Program's mission is to facilitate the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship. The program helps federal agencies:

- Meet energy goals and regulatory requirements
- Purchase energy-efficient products
- Manage energy-efficient and alternative fuel vehicle fleets
- Cultivate change to embrace efficiency and renewable energy
- Design, operate, and maintain high performance buildings
- Deploy renewable energy technologies

Industrial Technologies Program: The Industrial Technologies Program (ITP) leads the nation's drive to reduce energy intensity and carbon emissions by changing the way industry uses energy. ITP partners with U.S. industry in a coordinated program of research and development and supports the use of advanced technologies and energy management best practices.

The mission of ITP is to have U.S. industry lead the world in energy efficiency and productivity. It strives to transform the way U.S. industry uses energy by working with U.S. industries to save energy and money, increase productivity, and reduce environmental impacts by:

- Conducting research on new energy efficient technologies
- Supporting commercialization of emerging technologies
- Providing plants with access to proven technologies, energy assessments, software, and other resources
- Promoting energy and carbon management in industry

ITP has established a goal to drive a 25 percent reduction in industrial energy intensity by 2017, guided by the Energy Policy Act of 2005. The strategy also calls for an 18 percent reduction in U.S. carbon intensity by 2012, as guided by the Administration's National Goal to Reduce Emissions Intensity. For specifics on the program, see: http://www.epa.gov/climatechange/policy/intensitygoal.html

For the multi-year report of the Industrial Technologies Program, see: http://www1.eere.energy.gov/industry/about/pdfs/mypp_full_version.pdf

Vehicle Technologies Program: The Vehicle Technologies Program (VTP) is developing more energy efficient and environmentally friendly highway transportation technologies that will enable America to use less petroleum. VTP works with industry leaders to develop and deploy advanced transportation technologies that could achieve significant improvements in vehicle fuel efficiency and displace oil with other fuels that can be produced domestically in a clean and cost-competitive manner.

Current goals and activities of VTP:

- Development of hybrid-electric and plug-in hybrid-electric vehicles can provide significant improvement in fuel economy and petroleum displacement. Researchers are looking to make batteries more affordable and recyclable, as well as enhance battery range, performance, and life. This research supports President Obama's goal of 1 million plug-in hybrid vehicles by 2015.
- Deployment of alternative fuels can reduce oil imports. VTP leads in facilitating deployment of alternative fuels (ethanol blends, biodiesel, hydrogen, electricity, propane, and compressed natural gas) and fuel infrastructures by partnering with state and local governments, universities, and industry.

- Reducing vehicle weight improves vehicle efficiency and fuel economy. The introduction of cost-effective, high-strength materials can reduce vehicle weight without compromising safety.
- Improved combustion technologies and optimized fuel systems can improve fuel efficiency. Goals are to improve efficiency for passenger vehicles to 45 percent by 2010, and for commercial vehicles to 55 percent by 2013.

Two major government-industry initiatives include the FreedomCAR and Fuel Partnership and the 21st Century Truck Partnership:

- The goal of the FreedomCAR and Fuel Partnership is to develop emission- and petroleum-free cars and light trucks and the infrastructure to support them. The Partnership focuses on the high-risk research needed to develop the necessary technologies, such as fuel cells and advanced hybrid propulsion systems, to provide a full range of affordable cars and light trucks that are free of foreign oil and harmful emissions — and that do not sacrifice freedom of mobility and freedom of vehicle choice.
- The goal of the 21st Century Truck Partnership is for the nation's trucks and buses to move larger volumes of freight and greater numbers of passengers more safely and cost-effectively while emitting little or no pollution, coupled with a dramatic reduction in dependence on foreign oil.

Specific program areas in VTP include:

- Hybrid and vehicle systems technologies – analysis and testing activities that provide support and guidance for many cutting edge automotive and truck technologies.
- Energy storage technologies – critical enabling battery technologies for the development of advanced, fuel-efficient, light and heavy-duty vehicles.
- Power electronics and electrical machines technologies – motors, inverters/converters, sensors, control systems, and other interface elements that are critical to hybrid electric and fuel cell vehicles.
- Advanced Combustion Engines technologies – technologies that contribute to more efficient, advanced internal combustion engines in light, medium, and heavy duty vehicles.
- Fuels and Lubricants technologies – fuel and lubricant options that are cost-competitive, enable high fuel economy, deliver lower emissions, and contribute to petroleum displacement.
- Materials technologies – Lightweight, high-performance materials that can play an important role in improving the efficiency of transportation engines and vehicles.
- Educational activities – collegiate programs that help encourage engineering and science students to pursue careers in the transportation sector.

For fact sheet, see: http://www1.eere.energy.gov/vehiclesandfuels/pdfs/vehicles_fs.pdf

8. Smart Grid

http://www.oe.energy.gov/smartgrid.htm

A "smart grid" is designed to deliver electricity from suppliers to consumers using digital technology in order to save energy, reduce costs, and increase reliability. It is intended to be capable of routing power in more optimal ways to respond to a wide range of conditions. The Department of Energy concludes that the adoption of the smart grid will enhance every facet of the electric delivery system, including generation, transmission, distribution, and consumption. It is intended to energize utility initiatives that encourage consumers to modify their patterns of electricity usage. It also seeks to increase possibilities of distributed generation by bringing power generation closer to the users, such as solar panels on the roof of one's house. Other studies, such as one from the Energy Policy Initiatives Center at the University of San Diego School of Law, find that implementing "smart" communication and control technologies on local electric grids are both technically feasible and cost effective. To read the University of San Diego report, see:
http://www.sandiego.edu/epic/publications/documents/061017_SDSmartGridStudyFINAL.pdf]

Advocates of "smart grid" technology have called upon the federal government to appropriate funds for the Smart Grid Investment Matching Grant program created under the Energy Independence and Security Act of 2007. The program provides reimbursement for 20 percent of qualifying Smart Grid investments. Proponents claim that the stimulus effect will create new jobs in the renewable energy electricity sector as well as improving delivery to consumers.

SELECTED RESPONSES TO PROPOSED U.S. CLEAN ENERGY POLICIES

The debates over proposed energy legislation for the U.S. have been long and heated and, consequently, can be adequately addressed in this summary. Debates in the public sector and in the legislative halls range from whether "climate change" and global warming actually exists to the impact of new energy technologies on developing countries to whether the U.S. government should direct new energy initiatives or whether such things should be left to the market to determine. Below are a few samples of the responses to proposed legislation.

- Deutsche Bank Research regarding Proposed Cap and Trade Legislation:

  In a 2008 study of the proposed cap and trade legislation in the U.S., Deutsche Bank Research concluded that "if the U.S. were to take this new tack on climate policy, it would turn global climate diplomacy upside down. Pressure on emerging markets to adopt stringent climate policies would increase substantially. Prospects for convergence with the EU's climate policy would increase as well, perhaps even opening up emissions trading across the Atlantic." (1)

  The report concludes that international diplomacy would be strengthened if the U.S. itself would commit itself to more comprehensive and rigid climate policies. "Global climate policies in several strands (bilateral, regional and global) would be altered fundamentally if the U.S. were to become a strong and credible player leading by example. The whole pattern of alliance-building in diplomacy now still based on an EU-US conflict would give way to more cooperative approaches centered on building incentives for countries such as China, India, Brazil, and Indonesia to also cope with those challenges earlier and more comprehensively than so far." (28)

  The report also concludes that U.S. green markets would be the principal beneficiaries of tougher climate legislation. This would be the case since:

  - there is a large domestic market with appropriate regulatory incentive structures for developing and commercializing those technologies;
  - there has been an evolving shift in public opinion in favor of green policies;
  - there is a large portion of industrial policy that is dedicated to research and development in this sector;
  - research and development firms and universities are interested in inventing new technologies;
  - there is a large pool of venture capital available to get new energy technologies started;
  - there is strong interest in decreasing dependency on oil and gas imports from unstable regions of the world.

  The report concludes that there are additional benefits in foreign policy as a result of these climate policies. U.S. exports of green technologies would grow once the technologies are fully developed. U.S. foreign policy would "be able to adopt more flexible positions on the Middle East, the Caucasian region and Russia than Europe or Asia could afford." In addition, "U.S. capital markets would dominate 'green

investments' and generate jobs in the U.S. [and] U.S. climate diplomacy would probably use bilateral means with some major emitter countries to tackle GHG emissions in those regions as well, helping to bring about change in emerging markets."

Finally, the Deutsche Bank Research report notes that should the U.S. fail to pursue stringent climate policies at home, "the prospects of convincing other major emitters would be severely clouded as well. "

Source: "Cap and trade in America," Deutsche Bank Research, May 2008= http://www.banking-on-green.com/docs/cap_trade_america.pdf

- Heritage Foundation regarding U.S. Energy Policy:

As debates on "cap and trade" heated up in the U.S. Congress in early 2009, the Heritage Foundation, a think tank, argued that the proposed legislation was bad and would harm the American consumer and economy.

In response to the proposed renewable electricity standards that requires a specific percentage of electricity to come from renewable energy, Heritage argued that the alternatives are far too expensive to compete without federal incentives and that the federal government is forcing costlier energy options on the public. They conclude that the substantial tax breaks being offered to renewable will essentially cost the American public both as taxpayers and as utility ratepayers.

Heritage argued that too much of the energy plan is being driven by government as opposed to the private sector and market forces. "By subsidizing a portion of the actual cost of a project through a loan guarantee, the government is actually distorting the allocation of resources by directing capital away from a more competitive project," concludes Heritage. "Upgrading the nation's grid has merit, but it cannot be a bureaucratic, Washington-centric approach, nor can it be used as a subsidy to advance renewable energy sources, which means it does not have to be coupled with building new transmission lines. More efficient grid technology should be an investment made by the private sector, and if it will save money as Congress purports it will, consumers will do so."

In response to legislation establishing new energy efficiency standards, Heritage argued that those standards will "not painlessly lower electricity bills." Rather, the standards may impose higher costs since improvements in efficiency often add to the purchase price of goods. Furthermore, "manufacturers and consumers are perfectly capable of determining for themselves the proper balance between energy efficiency and other product attributes" and do not need the federal government's interference.

In response to the "cap and trade" provision, Heritage Foundation concludes that any carbon capping plan is "a costly energy tax in disguise that will raise energy prices and unemployment with little environmental benefit." In fact, the Foundation's Center for

Data Analysis conducted a study of the Lieberman-Warner cap and trade bill and found substantial Gross Domestic Product losses totaling some $5 trillion.

In response to legislation that would have foreign manufacturers and importers pay to cover carbon products coming to the U.S., Heritage concluded that the legislation would increase costs for consumers since all imports would be more expensive. Such a policy could result in a trade war since "other countries will view this as unfair….and respond by implementing more tariffs in retaliation."

Finally, with regards to the creation of green jobs, Heritage concluded that the transition to a clean energy economy may actually cost more jobs than it would create.

Source: "Bad Energy Policy and The Heritage Foundation's Response," The Heritage Foundation, 31 March 2009 -- http://blog.heritage.org/2009/03/31/bad-energy-policy-and-the-heritage-foundation%E2%80%99s-response/

THE STATE OF INDIANA AND ENERGY

- **Hoosier Homegrown Energy**

The State of Indiana's energy policy is handled by the Indiana Office of Energy Development, created in December 2005, which is under the leadership of Lieutenant Governor Becky Skillman. The plans for the state are included in the *Hoosier Homegrown Energy* strategic plan.

The *Hoosier Homegrown Energy* plan was drafted and adopted in 2006 as part of Governor Mitch Daniels' energy initiative. The strategy is to grow Indiana jobs and incomes by producing more of the energy needed from the state's own natural resources. In addition, the plan encourages increased conservation and energy efficiency. The principal goals of the plan are:

1. Trade current energy imports for future Indiana economic growth
2. Produce electricity, natural gas, and transportation fuels from clean coal and bioenergy
3. Improve energy efficiency and infrastructure

Proposed initiatives and projects include: coal gasification; biofuels and biomass; renewable; and energy efficiency.

The plan may be found at: http://www.in.gov/oed/files/Energy_Strategic_Plan_1-2.pdf

Why is the plan essential? Today, 75 percent of Indiana's energy expenditures leave the state in exchange for coal, natural gas, and oil. If the state could develop new sources of energy, that would bring large investments and thousands of jobs to the state, all while ensuring greater control over the state's energy future.

Goal: Trade Current Energy Imports for Future Indiana Economic Growth

The current energy situation means that Indiana consumers are dependent upon outside suppliers for energy and are subsequently held hostage to the prices that are charged. Importing energy and exporting capital is not seen as a wise path to increase energy investment in the state.

Through a Hoosier homegrown energy initiative, the state would reduce its dependency on outside sources for basic energy needs. By making energy here, the state can invest and create jobs that will help Hoosiers for the years to come. For example, a new 650 megawatt coal gasification power plant would create 800-900 construction jobs, 700 new mining jobs and other related jobs, require some 70 fulltime operators, and would consume $40 million in Indiana coal annually. (HHE, 1)

Goal: Produce Electricity, Natural Gas and Transportation Fuels from Clean Coal and Bioenergy

Currently, 13 percent of Indiana's generating capacity run on imported natural gas. Rising prices of gas would contribute to more expensive electricity. Based upon a study by Purdue University's State Utility Forecasting Group (SUFG), the state will need over 10,600 megawatts of additional electricity – the equivalent of 15 new plants -- by 2023.

Rather than construct new plants or expand the importation of natural gas, the state proposes that we turn to ready energy available in Indiana's coal reserves. However, much of that coal is high in sulphur content, which requires expensive clean air technologies. Thus, Indiana should develop clean energy opportunities to use our own coal. By pursuing clean coal technologies, and building new generating facilities, the state will benefit from new jobs and attract outside earnings by exporting excess electricity.

The plan also recommends unlocking the potential of biomass. Such biomass conversion may allow for the expansion of Indiana agriculture and other waste-producing ventures without increasing the amount of waste product for land fills. An increased waste stream, such as animal waste, landfill gas, and woody biomass, would serve as new resources in biomass energy.

To demonstrate the feasibility of biomass, the State of Indiana has developed a unique concept in Reynolds, Indiana – known as **BioTown, USA**. The purpose of the project is to meet the full energy needs of the town through biorenewable resources, including electricity, natural gas, and transportation fuel.

The state is also working to maximize its **wind energy** potential. Large-scale wind farms erected in rural areas can provide new sources of energy as well as provide farmers with new sources of revenue by opening their lands to energy development. Wind power could provide the electricity capacity of a new power plant within the next ten years.

The State of Indiana also has significant **natural gas** resources that can be utilized to increase economic development and enhance energy security of the state. Most of the sources are unconventional and are just now beginning to be developed. There is an estimated 8-13 trillion cubic feet of unconventional gas, which is about a twenty year supply at the current rate of consumption.

The state is also promoting the use of local coal sources for the production of **synthetic gas** (syngas), which would reduce dependence upon natural gas imports from Venezuela, Bolivia, and the Middle East.

The energy plan also calls for the development of **biomass conversion**. This would use animal waste, landfill gas, and wood waste to offset the use of traditional natural gas. The use of waste streams to produce biogas would help Indiana environmentally by turning worthless products often confined to landfills to valuable energy resources.

One key component of the Hoosier Homegrown Energy Plan is the intent to produce **synthetic transportation fuels**. In the early days of his administration, Governor Mitch Daniels committed to the production and use of biofuels in Indiana. The Clean Indiana Energy Bill of 2005 and subsequent legislation in 2006 laid the groundwork for biofuel production in the state, which included incentives to construct new production facilities and tax credits to retailers who sold biofuels. Through this biofuels initiative, Indiana is well positioned to become a top biofuel producer in the nation because of its ranking as one of the nation's top corn and soybean producers. In addition, there is a commitment to promote cellulosic ethanol production, which would convert virtually any plant or plant product (e.g. cellulosic biomass) to produce ethanol fuel.

Goal: Improve Energy Efficiency and Infrastructure

The Hoosier Homegrown Energy Plan recognizes the increasing demand for energy as well as growing interest in maintaining and improving environmental quality. One of the key ways to meet energy needs and keep energy prices low is to emphasize energy efficiency in all parts of Indiana. To accomplish this, the state intends to:

- Build greater awareness about ENERGY STAR products and practices.
- Nurture a stronger energy efficiency culture in the state's manufacturing sector through increased federal and state support for Purdue University's Technical Assistance Program and Clean Manufacturing Technology & Safe Materials Institute.
- Continue the work of the Governor's Heating Season Task Force and the "Help Thy Neighbor" Heating Fund to help Indiana residents who can not pay their energy bills.
- Update building codes for public housing and other buildings to emphasize energy efficiency and green technology.

The state also commits to the improvement of energy transportation systems. Since electricity can not be stored, the electricity transmission system must support sufficient movement of electricity to users. Similarly, there may be a need to develop a pipeline infrastructure to move coal and biomass-based synthetic fuels to supplement surface transportation.

If the state does pursue increased development of its coal deposits for fuel, there will be a need to revitalize the rail infrastructure. Currently, rail access between coal fields and power generators around the state is inadequate to meet anticipated need. As Indiana coal becomes more marketable, the state will need to ensure easy shipment of that coal around the state.

Finally, in an effort to improve energy efficiency, the State of Indiana intends to promote research and development of new technologies at its state universities. It will expand the 21st Century Research and Development Fund to target specifically energy technology development and commercialization.

In conclusion, the Hoosier Homegrown Energy Plan commits the State of Indiana to using new and emerging technologies to convert Indiana coal, corn, soy, and other renewable sources to energy and thus reduce dependency upon imports. The results should include more jobs in the state, economic and energy security, the ability to attract new businesses to the state, and ensuring a more stable, affordable supply of energy for Hoosier consumers.

For ongoing updates of the state's energy plan, visit: www.in.gov/oed

To view the complete Hoosier Homegrown Energy Strategic Plan, see: http://www.in.gov/oed/files/Energy_Strategic_Plan_1-2.pdf

- **Clean Coal in Indiana**

Indiana is listed among the top ten coal states in the United States. It annually mines about 35 million tons of coal. The implementation and commercialization of "clean coal" technologies is important to the state since Indiana coal is high in sulphur content and any increased use of coal in its present form would be damaging to the environment. The adoption of clean coal technologies would allow the state to tap this substantial energy resource at stable and relatively low costs as well as promote energy independence.

In fall 2007, the Indiana Utility Regulatory Commission approved a plan by Duke Energy to construct a $2 billion 630-megawatt clean coal plant. This plant will gasify coal using integrated gasification combined cycle technology. This process separates out regulated pollutants, such as mercury and carbon dioxide. The CO2 would have to be buried underground to keep it from reaching the atmosphere. The plant, located in Edwardsport, Indiana, is expected to be completed in 2012.

> Source: "Indiana approves 630 MW Duke clean-coal plant," Reuters, 20 November 2007 http://www.reuters.com/article/environmentNews/idUSN2054912620071120]

However, there seems to be some public hesitancy about this process. According to a survey conducted for TheCLEAN.org and the Civil Society Institute, four out of five state residents did not favor moving ahead with coal gasification plants. The findings include the following:

1. "Indiana residents do not favor proceeding immediately with two major coal gasification plants in the state. About four out of five states residents (81 percent) – including 72 percent of Republicans, 89 percent of Democrats and 88 percent of Independents – favor focusing first on renewable-energy technology, stepped up energy-efficiency measures and promoting "green jobs" versus moving ahead now (15 percent) with two new coal gasification plants for electricity generation and synthesized gas production for sale to gas utilities, as has been proposed by the Administration of Indiana Governor Daniels.

2. Indiana residents want Duke Energy -- not the state's ratepayers -- to foot the bill for the utility's research & development (R&D) work on underground carbon-storage

technology. More than four out five Indiana residents (84 percent) – including 79 percent of Republicans, 87 percent of Democrats and 94 percent of Independents-- say that "Duke Energy and shareholders should the bill for its own research and development (R&D)," compared to only 11 percent who think Indiana ratepayers should pay for Duke's R&D costs for technology that captures and stores carbon dioxide underground, as has been proposed by the electric utility and Indiana Governor Daniels.

3. Most Indiana residents want to see government aid for wind and solar power put on the same or better footing than coal-fired and nuclear power plants. Over half of Indiana residents (53 percent) and about the same number nationwide (52 percent) want the government to "evenly divide" any subsidies, tax breaks or other incentives for new construction "between nuclear power and coal-fired power plants and energy sources such as wind and solar." In Indiana 33 percent and 30 percent of Americans would go further, having the government "shift all or most of them from nuclear power and coal-fired power plants to energy sources such as wind and solar." Only about 19 percent of those in Indiana and one in 10 Americans would "keep the incentives for nuclear power and coal-fired power the way they are today."

Source: http://www.poweronline.com/article.mvc/Indiana-EnergyClimate-Survey-Most-In-State-0001?atc~c=771+s=773+r=001+l=a&VNETCOOKIE=NO

- **Biofuels in Indiana**

Under the leadership of Governor Mitch Daniels and Lieutenant Governor Becky Skillman, Indiana's biofuels industry has grown to national prominence. In just one year, Indiana grew from having one ethanol plant to 12 new plants and four biodiesel plants that will create some 600 jobs. The push to develop a biofuels industry in the state is an effort of the Indiana State Department of Agriculture, the Indiana Office of Energy Development, the Indiana Soybean Alliance, and the Indiana Corn Growers Association, among others.

The key reasons for promoting biofuels as alternative energy sources include:

- Reducing U.S. dependency on foreign oil
- Supports the American economy, particularly the agricultural industry
- Reduces carbon emissions into the environment
- Utilizes the rich agricultural resources of Indiana

In March 2006, Governor Daniels announced plans to build the world's largest biodiesel plant near Claypool, Indiana. The facility, to be operated by Louis Dreyfus Agriculture Industries LLC, will produce up to 250,000 gallons of biodiesel per day, meaning nearly 80 million gallons per year. The plant will utilize Indiana soybeans and will be fully integrated with a soybean processing plant. With this plant and two other biodiesel and six ethanol plants under construction, Indiana will move ahead as the leader in biofuel production.
[Office of the Governor, "Indiana Attracts World's Largest Biodiesel Plant, http://www.in.gov/apps/utils/calendar/presscal?PF=gov2&Clist=1_3_4_6_11_16_61&Elist=85999]

One of the largest ethanol plants opened in Madison County, Indiana, in 2008. It was built by South Dakota-based Poet, the world's largest ethanol producer, and has the capacity of using approximately 2.5 percent of the state's corn crop annually. Poet has plans to erect seven to nine plants in the State of Indiana. Currently, the company operates 23 ethanol plants in the U.S., which use 4 percent of the nation's corn crop. To ensure the longevity of ethanol, Poet is investing in a pilot plant in Iowa to produce ethanol from corn cobs and shucks (the waste from corn). ["Pumping Up Corn Demand," *Indianapolis Star*, 20 April 2008, pp. D1,4]

One innovative project in the biofuels initiative has been the creation of the Interstate 65 Biofuels Corridor. The project, originating with the U.S. Department of Energy, called for an increase in the biofuels fueling infrastructure along the Interstate, which runs 886 miles between Gary, Indiana, and Mobile, Alabama. The Indiana Office of Energy Development received a $1.3 million grant from the U.S. Department of Energy's Clean Cities Program to fund E85 ethanol and B20 biodiesel fueling stations along Interstate 65. As a result of this project, drivers will be no more than a tank-full away from a biofuels pump. Most of the infrastructure was in place by October 2008. For information on this project, see: www.I65BioFuelsCorridor.com

In September 2009, Indiana-based National BioFuels Distribution (NBD) expanded its product line by introducing their first branded fuel, Ignite Green racing fuel. Previously, NBD had focused on its core business of providing Ethanol 85 to municipal and corporate fleets. But, given the popularity of motorsports in the U.S., the company decided to expand its product line. Working with manufacturing partner Central Indiana Ethanol, NBD created a custom racing blend for use by today's racing teams. [Source: http://www.nationalbiofuel.net/]

In another effort to promote biofuels across Indiana, the Indianapolis Colts football team announced in September 2009 that it is partnering with Indiana corn and soybean producers to educate Indiana consumers about the benefits of using biofuels. The program, entitled "Hoosier Horsepower," centers around an educational component that is designed to connect with and educate students of all ages. It will focus on the agricultural heritage of Indiana as well as its contributions to the emerging alternative fuels industry in the state. [Source: "New partnership takes biofuels from farm field to football field, *Terre Haute TribStar*, 2 September 2009 -- http://www.tribstar.com/valley_life/local_story_245151711.html]

- **New Battery Technologies in Indiana**

The State of Indiana is becoming a center of research and development of new battery technologies. The lithium-ion battery industry, still in its early stages, is rapidly becoming the manufacturing and high-tech cornerstone of the new world economy.
For years, Indiana companies likeDelco Remy and, later, Delphi have been global leaders in the production of battery systems for advanced technology vehicles. It also is home to a number of established and emerging battery technology companies, including Delphi Electronic & Safety, the only U.S. manufacturer of hybrid power converters, controllers, and battery packs.

One of the newcomers to the field is advanced lithium-ion battery maker EnerDel, which is working to develop the energy sources that will power the hybrid and electric drive technologies being sought by automakers. EnerDel operates two factories in Indianapolis which are the first and only commercial-scale automotive lithium-ion battery manufacturing facilities in the U.S. The company recently received a $118.5 million grant from the U.S. Department of Energy under the federal stimulus program and is awaiting word on additional loans from the DOE's Advanced Technology Vehicle Manufacturing program. In addition to the automobile market, EnerDel's technology include the military, grid storage, and other growing markets, as well as the development of commercial fuel cell products. EnerDel predicts that it should be able to produce 600,000 hybrid electric vehicle packs per year by 2011 and build a second larger plant capable of producing battery packs for up to 1.2 million hybrid vehicles by 2015.

Indiana is also a national hub for battery systems development and testing for the defense and national security industry. The U.S. Navy's Naval Surface Warfare Center in Crane, Indiana, has forged partnerships with energy storage technology firms such as Raytheon, SAIC, ITT, General Dynamics, and others.

Source: Indiana Chamber of Commerce, http://www.in.gov/iedc/Energy.htm

On 5 August 2009, President Obama visited the economically-depressed area of Elkhart County, Indiana. It was there, while continuing his effort to establish a 21st century clean energy economy, where the President announced a $2.4 billion investment in 48 new advanced battery and electric car projects, including EnerDel, funded through the Recovery Act. The President noted:

> *For too long, we failed to invest in this kind of innovative work, even as countries like China and Japan were racing ahead. That's why this announcement is so important. This represents the largest investment of this kind of technology in American history.*

Source: The White House, http://www.whitehouse.gov/blog/Spurring-Innovation-Creating-Jobs/

Another key company is Reno, Nevada-based Altairnano, a leading provider of energy storage systems for clean, efficient power and energy management. It maintains its manufacturing headquarters in Anderson, Indiana, where it produces NanoSafe batteries – lithium ion batteries that power all-electric vehicles and which can be charged in 10 minutes at a commercial station or six hours using home power.

Indiana is in the midst of stiff competition in the advanced battery technology industry. Texas is seeking $1 billion to construct a lithium ion plant; Michigan is seeking to build four advanced battery facilities; and the state of Kentucky is partnering with the universities of Kentucky and Louisville and Argonne National Laboratory to develop a national research and development center in Lexington, KY. In addition the National Alliance for Advanced Transportation Batteries (NATTBatt) plans a research, battery plant, and headquarters south of Louisville.

- **Hybrid Car**

John Waters, a former General Motors engineer is the chief executive officer of Bright Automotive, a small company in Anderson, Indiana, that is working towards designing a 100 mile per gallon light truck assisted by electric power stored in a lithium ion battery. The goal of the company is to get an assembly line going by 2012 for mass production for this plug-in hybrid vehicle.

The company, spawned by development work at the Rocky Mountain Institute, has gathered about $20 million in support from companies like Google, Alcoa, and Duke Energy.

Many of Bright's engineers and executives are veterans of the electric car business. CEO Waters was the battery pack engineer for GM's EV1, an electric vehicle briefly produced in the 1990s but later eliminated by the company. Since leaving GM, Waters worked on lithium ion battery technology at auto parts maker Delphi and EnerDel. He developed the lithium ion battery system that is used in the Segway Human Transporter.

According to the design plans, the car's interior will be made by Johnson Controls from recyclable materials. Alco will provide aluminum for the rust-free exterior. Other parts will come from major parts manufacturers.

Sources: Ron Gifford, "Bright Automotive: The Full Meal Deal," *indyPARTNERSHIP* 8 August 2009 -- http://blog.indypartnership.com/blog/indiana-transportation-logistics/0/0/bright-automotive-the-full-meal-deal;

John Waters, "Plugged into the future of auto technology," *Indianapolis Star*, 5 August 2009, p. A9]

In April 2009, Bright Automotive unveiled a prototype of its 100-mile per gallon, plug in hybrid in Washington, D.C. The van weighs only 3,200 pounds, or about 1,500 pounds less than vans with similar hauling capacity. The van can run for 30 miles on a full charge. Then, the hybrid combines gasoline and electric power.

Source: "Indiana-based Bright rolls out Idea: 100 mpg commercial van," USA Today, 21 April 2009 -- http://content.usatoday.com/communities/driveon/post/2009/04/65809989/1

- **Wind Energy in Indiana**

Since the late 1990s, the U.S. Department of Energy Wind Powering America program has emphasized state-based approaches to deploying wind energy technologies. It has helped to form state wind working groups in many states. The Indiana Wind Working Group (IWWG) was created by the Office of Energy and Defense Development in 2005. The Working Group seeks to develop multi-stakeholder efforts to sponsor workshops, manage loan programs, and host community meetings regarding the development of wind energy potentials.

Indiana is now home to the largest wind farm east of the Mississippi River. It has been ranked by the American Wind Energy Association as the fastest-growing state for wind energy development in the nation in 2008. Innovative wind power companies like Horizon Wind Energy, BP America, Dominion, Fairfield Manufacturing Co, ATI Casting Service, and Brevini Wind USA have chosen to do business in Indiana.

One of the largest projects is Horizon Wind Energy, which is installing up to 660 turbines spread over 100,000 acres in White County, located in northwest Indiana. When operating at full capacity, the project could produce more than 1,000 megawatts per year – enough to power 300,000 homes. Horizon plans smaller wind farms in Randolph, and Howard counties. Sempra Energy of San Diego, California, has partnered with BP Wind Energy to develop a wind farm in Benton County.

Denise Bode, president of the American Wind Energy Association (AWEA) noted that, "Indiana will benefit from these new wind farms, and is also one of the states that stands to benefit the most from new manufacturing jobs in the wind turbine supply chain. As wind power expands in the country, Indiana could become a hub for the manufacturing of some of the 8,000 components that make up a modern wind turbine."

> Source: American Wind Energy Association, http://www.awea.org/newsroom/releases/Indiana_celebrates_Wind_Energy_Week_10Apr09.html

A survey sponsored by the American Wind Energy Association in April 2009 found that:

- 81 percent of Indiana voters favor a Renewable Energy Standard that requires electric utility companies across the nation to generate at least 15 percent of their electricity from renewable energy sources by 2021; 13 percent were opposed.
- The issue generates bipartisan support – 95 percent of Indiana Democrats, 78 percent of Independents, and 71 percent of Republicans favor the proposal.

The report "20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply" prepared by the U.S. Department of Energy in 2008 offers the nation's plan to develop wind energy and additional insights into how states are participating in this initiative. See the plan at: http://www.in.gov/oed/files/20percent_wind_energy_report_05-11-08_wk.pdf

To further assist in the development of wind energy sources, Purdue University has developed a report, "The Wind Energy Ordinance Process for Local Government," to assist Indiana counties in the development of wind resources. The report may be found at: http://www.extension.purdue.edu/extmedia/ID/ID-407-W.pdf

One of key contributors to the emerging wind energy industry in Indiana is Brevini Power Transmission. The Italian company selected Muncie, Indiana as its North American headquarters and as the site for a factory that will manufacture gearboxes for energy-generating wind turbines.

- **Other Clean Energy Initiatives in Indiana**

  - **Richard G. Lugar Center for Renewable Energy**

    The Purdue University School of Engineering and Technology established the Richard G. Lugar Center for Renewable Energy in March 2007 to address the societal needs for clean, affordable, and renewable energy sources, improve the nation's energy security, and reduce global warming. Its primary mission is to promote research excellence in the area of renewable energy through collaborative efforts among faculty in the disciplines of engineering, chemistry, physics, biology, and environmental affairs. It promotes renewable energy applications through teaching, learning, civic engagement, and partnerships with industry, government labs, and local communities. The Center is located at Indiana University Purdue University Indianapolis.

    Participating faculty include specialists in fuel cells, renewable hydrogen, clean combustion, ethanol production, power grids, and pollution issues. For more information on the Lugar Center for Renewable Energy, visit: http://www.lugarenergycenter.iupui.edu/

  - **Energy Systems Network**

    The Central Indiana Corporate Partnership has established the Energy Systems Network (ESW) to promote Indiana's clean energy technology opportunities. Clean technologies, or 'cleantech' is the collection of industries that bring energy innovations to consumers – from putting hybrid and plug-in electric vehicles on our highways to building the 'smart grid' and other advances that make renewable energy a realistic option for families and businesses.

    The **Energy Systems Network** (ESN) is a new Indiana-based clean-tech initiative. The ESN is a catalyst for partnerships among private firms and research institutions to bring energy breakthroughs to market, leveraging Indiana's strong manufacturing sector, research and development capabilities, and heritage of engineering advanced power systems. Clean-tech sub-sectors like wind and solar power, plug-in/hybrid electric vehicles, second generation biofuels, distributed power generation, and systems

integration are each projected to grow to more than $70 billion over the next ten years. Indiana has unique strengths in all of these areas, and the ESN aims to make the state a center for energy innovation, attracting new investment and creating 'green jobs' for Hoosiers.

ESN member companies and institutions include, among others: Duke Energy; Cummins; Delphi; Alison Transmission; Remy; IBM; SAIC; Rolls Royce; Raytheon; Indianapolis Power & Light; Brevini; I-Power; EnerDel; AltairNano; Bright Automotive; Rocky Mountain Institute; Midwest ISO; Naval Surface Warfare Center Crane; Purdue University; Indiana University; the University of Notre Dame; Ivy Tech Community College.

Source: http://www.cincorp.com/energysystemsnetwork/

Governor Mitch Daniels and Indiana's Energy Policy

Since becoming Governor of the State of Indiana in 2005, Mitch Daniels has pushed a comprehensive energy plan for the state. [See the Hoosier Homegrown Energy Strategic Plan in the Appendices and at: http://www.in.gov/oed/files/Energy_Strategic_Plan_1-2.pdf He has promoted the development of biofuels, which has moved Indiana to become one of the leading states in biofuel production. He has endorsed a national goal of 25 percent renewable energy by 2025 and has used that to promote clean energy technologies in the state. Consequently, Indiana has witnessed a rapid growth in the number of wind power generating farms and increased pursuits for energy efficiency.

"Cap and Trade": One issue on which Governor Daniels has been very vocal is the current debate over the **"cap and trade"** provision of the Waxman-Markey American Clean Energy and Security Act. In May 2009, Governor Daniels expressed his opinion on this matter in an editorial in *The Wall Street Journal* (15 May 2009):

Indiana Says 'No Thanks' to Cap and Trade

No honest person thinks this will make a dent in climate change.

By Mitch Daniels

This week Congress is set to release the details of the Waxman-Markey American Clean Energy and Security Act, a bill that purports to combat global warming by setting strict limits on carbon emissions. I'm not a candidate for any office -- now or ever again -- and I've approached the "climate change" debate with an open-mind. But it's clear to me that the nation, and in particular Indiana, my home state, will be terribly disserved by this cap-and-trade policy on the verge of passage in the House.

The largest scientific and economic questions are being addressed by others, so I will confine myself to reporting about how all this looks from the receiving end of the taxes, restrictions and mandates Congress is now proposing.

Quite simply, it looks like imperialism. This bill would impose enormous taxes and restrictions on free commerce by wealthy but faltering powers -- California, Massachusetts and New York -- seeking to exploit politically weaker colonies in order to prop up their own decaying economies. Because proceeds from their new taxes, levied mostly on us, will be spent on their social programs while negatively impacting our economy, we Hoosiers decline to submit meekly.

The Waxman-Markey legislation would more than double electricity bills in Indiana. Years of reform in taxation, regulation and infrastructure-building would be largely erased at a stroke. In recent years, Indiana has led the nation in capturing international investment, repatriating dollars spent on foreign goods or oil and employing Americans with them. Waxman-Markey seems designed to reverse that flow. "Closed: Gone to China" signs would cover Indiana's stores and factories.

Our state's share of national income has been slipping for decades, but it is offset in part by living costs some 8% lower than the national average. Doubled utility bills for low-income Hoosiers would be an especially cruel consequence of the Waxman bill. Forgive us for not being impressed at danglings of welfare-like repayments to some of those still employed, with some fraction of the dollars extracted from our state.

And for what? No honest estimate pretends to suggest that a U.S. cap-and-trade regime will move the world's thermometer by so much as a tenth of a degree a half century from now. My fellow citizens are being ordered to accept impoverishment for a policy that won't save a single polar bear.

We are told that although China, India and others show no signs of joining in this dismal process, we will eventually induce their participation by "setting an example." Watching the impending indigence of the Midwest, and the flow of jobs from our shores to theirs, our friends in Asia and the Third World are far more likely to choose any other path but ours.

Politicians in Washington speak of a reawakened appreciation for manufacturing and American competitiveness. But under their policy, those who make real products will suffer. Already we observe the piranha swarm of green lobbyists wangling special exemptions, subsidies and side deals. The ordinary Hoosier was not invited to this party, and can expect at most only table scraps at the service entrance.

No one in Indiana is arguing for the status quo: Hoosiers have been eager to pursue a new energy future. We rocketed from nowhere to national leadership in biofuels production in the last four years. We were the No. 1 state in the growth of wind power in 2008. And we have embarked on an aggressive energy-conservation program, indubitably the most cost-effective means of limiting CO_2.

> Most importantly, we are out to be the world leader in making clean coal -- including the potential for carbon capture and sequestration. The world's first commercial-scale clean coal power plant is under construction in our state, and the first modern coal-to-natural gas plant is coming right behind it. We eagerly accept the responsibility to develop alternatives to the punitive, inequitable taxation of cap and trade.
>
> Our president has commendably committed himself to "government that works." But his imperial climate-change policy is government that cannot work, and we humble colonials out here in the provinces have no choice but to petition for relief from the Crown's impositions.
>
> Source: *The Wall Street Journal*, 15 May 2009 -- http://online.wsj.com/article/SB124234844782222081.html

In a Republican Party radio address on 30 May 2009, Governor Daniels offered additional comments on the "cap-and-trade" legislation:

> The national energy tax imposed by Speaker Pelosi's climate change bill would double electric bills here in Indiana, working a severe hardship on low-income families, but that's only where the damage starts. In a state where we like to make things, like steel and autos and RVs, it would cost us countless jobs, many of them heading off-shore to China and India. Our farmers and livestock producers would see their costs skyrocket. And our coal miners would be looking for new work, while we leave affordable, homegrown energy idle in the ground.
>
> And all for what? Even if one believes the Administration's own computer models, which they claim can predict temperatures fifty years away, the CO_2 reductions from their bill will not budge the world thermometer by a tenth of a degree.
>
> Source: "Gov. Mitch Daniels: Wrong on Cap-and-Trade," MediaMatters Action Network, 29 May 2009 -- http://mediamattersaction.org/factcheck/200905290009

Overall, Republicans from Indiana have expressed their opposition to the Waxman-Markey cap and trade legislation. In May 2009, they gathered to voice their concerns about the impact on the state of Indiana.

- U.S. Representative Mike Pence, who heads the American Energy Solutions Group, labeled the bill an imperialistic "economic declaration of war by the liberals on the Midwest." He argued that eight of Indiana's nine Congressional districts would be impacted negatively because of the high amounts of energy Indiana's large manufacturing base needs to make things.

- Gov. Daniels said that the bill would amount to a "doubling of utility costs" for Hoosiers, which would diminish the lure of Indiana as a friendly business state. He said that the cost of the "cap and trade" legislation" would be "certain, massive, and immediate. The benefits of these policies will be dubious, miniscule, and decades in the distance…The bill as it is currently designed is not good for America and is hazardous and dangerous for Indiana."
- U.S. Representative Dan Burton characterized the Waxman-Markey bill as a potential "anchor" on the Indiana economy. U.S. Representative Steve Buyer said that numerous studies had concluded that the increased cost of energy on a family of four would be between $2,500 and $3,100 annually, with utility rates increasing 40 to 50 percent.

John Goss of the Indiana Wildlife Federation, the former Indiana Department of Natural Resources Commissioner and a Democrat, argued that the Republican response did not address the concessions in the Waxman-Markey legislation that would protect jobs in Indiana and the Midwest. He also said that the claims of doubling utility bills would not be the case, thanks to amendments to the bill that were proposed by Duke Energy, Alcoa, Caterpillar, the Nature Conservancy, and others. Likewise, Terrence Black of Greenway Supplies of Indianapolis refuted concerns about job losses in Indiana. He cited a study by the Center for American Progress that predicted at least 43,000 green jobs coming to Indiana in the next five years. "When they [the Republicans] are concerned about job loss, I don't know where they are coming from. There will be two to three times jobs in green energy and nuclear. It needs to be part of the mix."

Sources: "Hoosier GOP Sound Alarm Over Cap & Trade," *Howey Politics,* 27 May 2009 – http://www.howeypolitics.com/2009/05/27/hoosier-gop-sound-alarm-over-cap-trade/

The Center for American Progress reports include:

1. "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy," September 2008 -- http://www.americanprogress.org/issues/2008/09/pdf/green_recovery.pdf

2. "Progressive Growth: Transforming America's Economy through Clean Energy, Innovation, and Opportunity," November 2007 – http://www.americanprogress.org/issues/2007/11/pdf/progressive_growth.pdf

Clean Energy: On 30 September 2009, Governor Daniels spoke at the Indiana Energy Conference where he said that the pursuit of "green jobs" and alternative fuels could increase energy costs without improving the environment. He noted that the state's manufacturers rely upon affordable energy and that the proposed caps on carbon emissions pending in Congress are misguided and "rockheaded." Daniels pushed for increased production of ethanol, biodiesel and wind power, but noted that such alternative energy sources could not completely replace fossil fuels.

Source: "Mitch Daniels has green energy doubts," *WANE.Com*, 1 October 2009 -- http://www.wane.com/dpp/news/indiana/indiana_ap_indianapolis_mitch_daniels_has_green_energy_doubts_200910010800_rev1

Investments in Clean Tech/Green Jobs in Indiana

With the new interest in energy efficiency and clean technologies sweeping the nation, many in Indiana have called for the state to step up to be a leader in the field. Already, there are major developments (as noted above) in wind farms, battery technologies, and energy efficient vehicles in the state.

Professor John W. Maxwell of the Indiana University Kelley School of Business expressed his opinion about the place that Indiana can claim in the new "clean tech, green jobs" sector. Likewise, Tom Sparrow, a retired professor of industrial engineering at Purdue and former chair of the State Utility Forecasting Group, calls for Indiana to pursue "clean coal" technology. Their columns are reproduced below.

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John W. Maxwell, "Indiana Has Great Potential to Land Jobs," *Indianapolis Star*, 26 July 2009

I've spent much of the past year out of state, but upon my return this summer, I've noticed a distinct uptick in interest in renewable energy and so-called "green jobs" in Indiana. Is this all just green hype? Should Indiana bother to invest resources in the clean-tech sector, or will such investments be seen as a waste as the hype passes?\

More importantly, if we believe that the quest for cleaner energy is here for the long term, how will that impact the state? At first glance, a push toward clean energy might be seen as a blow for the state. Indiana obtains much of its energy from coal, considered a very dirty source of energy, and our initial reaction might be to resist this movement.

This would be a mistake. I see great potential for Indiana in this clean-tech movement. Much of the world burns coal for energy. If Indiana companies discover how to burn coal cleanly, the world will beat a path here.

Can Indiana compete on a global level in the clean-tech sector? It has all the elements to be successful, and with the right strategy, I believe it can be. Indiana has world-class universities

that embody leading engineering, computing, and business schools. We have a great deal of manufacturing expertise, much of it arising from the quickly transforming auto sector. This sector already embodies the knowledge needed to build today's wind energy systems, for example. We possess a leading logistics industry that can help Indiana businesses get products to markets in a fast, efficient manner.

Should we sit back and let market mechanisms work to bring green jobs to the state? While green jobs will come regardless of what we do as a state, there are things we can do to help ensure we attract the research and development and high-tech ends of the manufacturing process, rather than the lower end of the production, distribution, and installation processes.

Since Indiana currently is not a leader in the clean-tech venture capital industry, we need to signal to outsiders that this is a good place to set up shop and invest in basic research. I don't believe governments can pick winners. I am dubious, for example, of Michigan's commitment to the battery sector. Instead, the state needs to attract and retain investment in the clean-tech sector.

These are a well-educated work force, high quality infrastructure and support for the small business/new venture sector. In addition to these basics, the state can take additional actions to increase its attractiveness to the clean-tech sector.

First and foremost, the state needs to recognize that clean-energy investments are capital intensive, requiring long payback periods. This means that incentives aimed at attracting investments need to exhibit long-term stability. They should be implemented through legislation rather than through short-term programs that can be rescinded or changed.

As an example, consider renewable portfolio standards for energy producers. Roughly speaking, these standards, already in place in several states, dictate the percentage of energy produced by each producer that must come from renewable energy. Studies have shown that the way states implement standards affect the level of investment in the renewable energy sector.
Not surprisingly, legislated goals that are hard to reverse attract the highest level of investments. Companies are reluctant to invest where mechanisms are easier to change. In this case, producers prefer to buy renewable energy out of state using the grid to "import" that energy. The state can also show commitment by joining others in various regional carbon trading schemes rather than holding the "observer status" as it currently does.

In short, green jobs will come to Indiana when all sectors of our economy make investments required to enhance efficiency and use cleaner, renewable energy. The state does have a role to play, however, in attracting high-value-added jobs in the clean-tech sector.

Tom Sparrow, "Technology Can Help State Clean Air, Meet Energy Needs," Indianapolis Star, 13 January 2008, E1]

The new $2 billion Duke Energy power plant in Edwardsport will be the most efficient of its kind when it's completed in 2012 thanks to a new innovation that produces clean energy from coal.

Innovations such as this are making coal – of which Indiana has an abundance – economically and environmentally competitive. This is good news for Indiana and for the nation. Clean-coal technology can reduce emission levels for new and existing power plants, bringing them into compliance with federal regulations.

Stricter Environmental Protection Agency regulations affecting coal-fired plants will go into effect in the next three years. Power companies must reduce emissions of sulfur, nitrous oxide and mercury, which will be reduced by 70 percent over the next decade. In addition, climate change concerns could prompt Congress to impose more stringent standards on carbon dioxide emissions.

We have the technology available to make coal significantly friendlier to the environment and to make it an economically competitive power source. Natural gas and petroleum prices have doubled in the last decade, but coal prices have remained virtually stagnant.

We also have a tremendous supply of coal. Coal is to Indiana what petroleum is to OPEC countries. There is adequate coal underground in this state to power it for 250 years, and Indiana produces only about 3 percent of American coal.

Besides supply and price, coal offers a transportation advantage. It costs less to transport coal domestically than to import oil or natural gas from other nations.

Nuclear energy also has potential, but until secure processes to recycle spent nuclear fuels are in place, nuclear energy will be less welcomed than other energy sources. Alternative fuels such as wind, hydroelectric and solar power each represent potential to add power to the national grid, but of the fuels available for uninterrupted energy production on a commercial scale, coal is the best option – provided we can meet environmental standards.

Clean-coal technology will enable Duke to reduce its emissions in Edwardsport well below state and federal limits while, at the same time, using less coal to produce energy. Its carbon dioxide emissions alone will rate 45 percent less than the plant it is replacing. Emissions may be even less, pending approval of a plan to remove another 18 percent of carbon in the firing process.

The Duke project is coming at a critical moment. A report released last summer by the nonpartisan Environmental Integrity Project found that Indiana and other states had some of the worst emissions levels in the nation. Although nation-wide carbon dioxide emissions had slightly declined, mercury emissions had remained steady and progress had been made in reducing sulfur dioxide and nitrogen oxides.

Perhaps surprising to some, vehicles were not the primary problem. Rather, power plants produce 40 percent of the carbon dioxide, about two-thirds of sulfur dioxide, 22 percent of nitrogen oxides and one-third of mercury.

Based on data from the EPA and the Department of Energy, the report found that a disproportionate share of emissions are generated from a handful of older plants that either operate inefficiently or have not been retrofitted with pollution controls. The Harvard School of Public Health has found that sulfur dioxide emissions from power plants significantly harm the cardiovascular and respiratory health of people who live nearby.

Another concern is the growing cost and demand.

A new report by the State Utility Forecasting Group, prepared with the help of Purdue University, predicts that increased fuel and building materials costs, combined with energy demand by industry, will result in a 22 percent increase in power costs for residential customers by 2012. For commercial and industrial consumers in Indiana, the jump is expected to be 20 percent. This will require new or retrofitted power plants.

Poor EPA ratings, growing demand and higher costs must be met with the more efficient and cleaner clean-coal technology. The good news is that it's ready and available.

It's a breath of fresh air for Indiana.

The Republic of Korea's Energy Initiatives

According to the Energy Information Administration of the U.S. Department of Energy, South Korea is almost entirely dependent on imports to meet its energy consumption needs. It is the fifth largest importer of oil in the world and a significant importer of liquefied natural gas. Oil makes up the greatest share of South Korea's total energy consumption. Oil supplied approximately 50 percent of the nation's total energy consumption in 2004, compared with 65 percent in 1994. Coal is South Korea's second largest source, supplying 24 percent of primary energy consumption. Nuclear power supplies 14 percent and natural gas 12 percent. Hydropower and other renewable energy sources make up a small fraction of South Korea's energy portfolio.

Over the years, South Korea's economic and technology development was achieved based on the perceived infinite supply of energy, based primarily on the consumption of fossil fuels. In the 1990s, however, the Climate Change agreement combined with the increasingly unstable energy supply in the global market led the Korean government to change its energy structure and explore alternative fuel sources. Since then the government has devised comprehensive countermeasures that address the climate change agreement, including initiatives to develop new and renewable energy, promote energy conservation, and improve energy efficiency. The Korean government's willingness to pursue such sustainable energy policies has great positive implications.

In January 2007, the South Korean government held a State Energy Committee meeting to discuss a long-term national energy policy plan known as "Energy Vision 2030." The proposal calls for an increase in renewable energy (wind, tidal, solar) from 2 percent to 9 percent. About the same time, South Korea's largest wind power farm began operation in the Taegwanryong area in Kangwon Province. Each of 49 wind turbines is capable of producing 2 megawatts of electricity.

Source: "Wind Power on the Rise in South Korea," *Renewable Energy World.com*, 15 January 2007 -- http://www.renewableenergyworld.com/rea/news/article/2007/01/wind-power-on-the-rise-in-south-korea-47109

In May 2007, South Korea announced that it would break ground in Shinan for the world's largest solar power plant in an effort to diversify its power sources and use cleaner energy. The plant will feature 109,000 rectangular solar modules that will cover a plot the size of 80 football fields. It will produce more than 27,000 megawatt-hours of electricity per year.

Source: "World's Largest Sun-Tracking Photovoltaic Plant Opens in Shinan," Invest Korea, 13 November 2008 -- http://jeonnam.investkorea.org/InvestKoreaWar/work/reg/eng/ne/index.jsp?l_unit=90202&m_unit=90306&code=12901&no=608300004&bno=811130019&seq=190&page=

Electricity from a solar power plant costs seven times as much as electricity generated by a nuclear or fossil-fuel power plant in South Korea, noted Lee Gil Jae, president of Dongyang Engineering and Construction, which will operate the plant. But as the nation sees it greenhouse gases increasing faster than many other countries, South Korea agreed to subsidize the solar power plant as part of a program to encourage clean energy industries. In 2006 alone, the government spent $444 million on that program.

In an effort to reduce its dependency on foreign oil, South Korea is pursuing alternative sources of energy. It is exploring offshore gas reserves and new and renewable energy sources. The city of Incheon, west of Seoul, is building a large tidal energy plant that calls for connecting four islands with a 4.8-mile barrier and installing dozens of turbines that will harness the energy of the tides.

> Source: "South Korea seeks cleaner energy sources," *New York Times*, 9 May 2007 -- http://www.nytimes.com/2007/05/09/business/worldbusiness/09iht-solar.1.5635438.html
>
> See also: Esook Yoon, "South Korea's Sustainable Energy Policies." A paper presented at the annual meeting of the International Studies Association, February 2007.

South Korea's "Green New Deal"

In January 2009, the Government of South Korea announced that it would invest 50 trillion won ($38.1 billion) over the next four years on environmental projects in a "Green New Deal" to spur economic growth and create nearly one million jobs. Prime Minister Han Seung-soo said that the work would focus on energy conservation, recycling, carbon reduction, flood prevention, development around the nation's four main rivers, and maintaining forest resources. He reported that the plan will lead to the creation of some 960,000 new jobs with nearly 140,000 to be realized in the year 2009.

Facing a slowing economy and lower demand for its traditional goods such as automobiles and technological products, South Korea sees this investment as a way of creating new jobs in the "green energy" economy, even though unemployment stands at 3.1 percent.

> Source: "Green New Deal" for South Korea: $38.1 Billion," The Huffington Post, 6 January 2009 -- http://www.huffingtonpost.com/2009/01/06/green-new-deal-for-south-_n_155504.html

Korea's announcement in January 2009 earned recognition from the United Nations Environment Programme (UNEP). "UNEP's Global Green New Deal and Green Economy initiative are clearly two ideas whose time has come, as evidenced by the Republic of Korea and Japan's stimulus package announcements alongside those of other key economies and leaders from China to the President-elect of the United States," said Executive Director Achim Steiner. "Investments in clean-tech and renewable energy; infrastructure such as railways and cycle tracks and nature-based services like river systems and forests, can not only counter recession

and unemployment but can also set the stage for more sustainable economic recovery and growth in the 21st century."

> Source: "'Green' stimulus plans by Japan and Republic of Korea hailed by UN environment chief," *UN News Centre*, http://www.un.org/apps/news/story.asp?NewsID=29505&Cr=climate&Cr1=change

In June 2009, the Korean government endorsed a five-year plan of green growth, the first in the world, that combines industry policy and public mobilization. The government's financial stimulus plan earmarks about 81 percent of the funds for green projects. The plan seeks to restructure the nation's economy by creating approximately one million new jobs. It intends to improve energy efficiency and increase the share of renewables from 2.4 percent in 2007 to 20 percent by 2050. Other measures include investments in low-carbon infrastructures, public transport (e.g. bicycle paths), support for electric cars, construction of green homes, revitalization of polluted rivers, creation of a carbon emissions trading and a system of eco-taxes and financial incentives for corporations and consumers to invest in sustainable development.

> Source: "South Korea – Greenest new deal?" EuropeanGreens.EU, 10 June 2009 – http://europeangreens.eu/menu/blog/blog-single/?tx_ttnews%5Btt_news%5D=1342&cHash=065af609c5

In addition to Korea's leadership in adopting a "Green New Deal," representatives of the G20 who met in Pittsburgh, Pennsylvania in September 2009 discussed the United Nation's "Global Green New Deal," which includes provisions pertaining to energy efficiency, renewable energy technologies, sustainable transport technologies, sustainable agriculture, and the planet's environment. The Republic of Korea was one of several nations singled out for progress in pursuing the "Global Green New Deal." For more information on this plan, visit: http://www.unep.org/greeneconomy/LinkClick.aspx?fileticket=ciH9RD7XHwc%3D&tabid=1393&language=en-US

Conclusion

A clean energy economy, as proposed by President Barack Obama, is still in its infancy, though it has become a key cornerstone to America's 21st century economic landscape. Consumers are looking to cleaner, more efficient energy. Investors have demonstrated eagerness to capitalize on new market opportunities. Policymakers are working at the local, state, and national levels to address concerns over the environment as well as to create policies that will stimulate economic growth and create jobs for the future.

Today, every state has a piece of the clean energy economy. Some have been more aggressive than others in pursuing new technologies and the jobs that accompany them. Policymakers at the state level want to see their states flourish and are debating ways of offering financial incentives for clean energy generation, developing laws that reduce deadly emissions, and promoting economic development for their states.

The American Recovery and Reinvestment Act of 2009 is a significant step forward for the development of a clean energy economy in the United States. It is pumping billions of dollars into research and development, job training, and other initiatives that will diversify the nation's energy portfolio, develop new energy efficient industries, and contribute to a cleaner environment.

A study by the Pew Center on the States reported that the most clean energy economy jobs (65 percent) are in the category of Conservation and Pollution Mitigation, that is, recycling waste, conserving water, and mitigating emissions. The other categories – Clean Energy, Energy Efficiency, and Environmentally Friendly Production – are growing at a faster rate. Pew also noted that about 80 percent of venture capital investments in 2008 were in the Clean Energy and Energy Efficiency sectors – those areas working to develop clean, renewable energy sources and products and services that reduce our overall energy consumption.

One of the key areas in promoting a clean energy economy is the ability to craft appropriate public policies. These policies may be comprehensive energy plans (like the Hoosier Homegrown Plan in Indiana), renewable energy standards and energy efficiency measures for buildings and appliances, fuel and emission standards for vehicles, and job training for the transition to the new economy. While it is uncertain as to the eventual outcome of such policies, it is clearly evident now that policies adopted by the federal, state, and local governments have excited the private and public sectors to explore new technologies and processes to reach the specified goals. For example, the Pew Center's report found:

- Forty-six states offer some form of tax incentive to encourage corporations and residents to use renewable energy or adopt energy efficiency systems and equipment.
- Thirty-three states provide residential, commercial, and industrial loan financing for the purchase of renewable energy or energy efficiency systems or equipment.
- Twenty-two states offer rebate programs to promote installation of solar water heating or solar panels for electricity generation.

- Twenty-nine states and the District of Columbia have adopted renewable energy portfolio standards, which require electricity providers to supply a certain percentage of power from renewable energy sources.
- Nineteen states have established energy efficiency standards for energy generation, transmission, and use.
- Fourteen states and the District of Columbia have adopted California's vehicle emission standards, which allow states the right to require automakers to reduce carbon emissions from new cars and light trucks more aggressively than federal standard mandates.

While the role of the federal government in advancing the cause of a clean energy economy is one of the hotly debated issues, one can not deny that the U.S. government has played an important role in adopting policies and making investments that have sparked creative research, economic growth, and greater environmental awareness. Laws passed in the 1960s and 1970s contributed to the emergence of the recycling and waste reduction/management industries. The EPA's ENERGY STAR and Water Sense labels have inspired consumers to seek and purchase more efficient products. In 2007, President George W. Bush signed the Energy Independence and Security Act into law, the first congressionally mandated increase in fuel standards for cars and light trucks in more than 30 years. Earlier in 2009, President Obama enacted even stricter standards for American vehicles. As another example of federal involvement, the passage of the American Recovery and Reinvestment Act places the government squarely in the middle of building that clean energy economy by providing $85 billion in energy- and transportation-related spending.

What then are the implications of the Obama Administration's pursuit of a clean energy economy for South Korea?

It is clear that both the United States and South Korea are actively pursuing new energy policies and technologies to address the needs of the future. In many cases, the nations are on the same track. Both believe that their respective futures rely upon a clean energy economy. They have adopted policies that encourage the development of new technologies that tap renewable sources and each has seen a substantial increase in the implementation of those technologies. Both nations recognize that continued carbon emissions are damaging the environment and should be addressed immediately to prevent further deterioration. Furthermore, both nations are concerned about current and future national security since both depend heavily (South Korea more so) on imported petroleum, thus making each highly dependent upon an energy source that originates in rather unstable areas of the world.

South Korea has already demonstrated its willingness to use government incentives to build its new clean energy economy. The U.S. has followed suit with the sizeable commitment of government funds for clean energy technology in the 2009 American Recovery and Reinvestment Act. At this point in time, however, it is not certain what impact the Recovery Act will have on the development of the new clean energy economy in either country. Also, since debate on the "cap and trade" legislation continues in the U.S. Congress, we do not know the outcome or its impact on future policies.

Consequently, both the United States and South Korea should be monitoring policy developments in each nation to see what becomes of these ongoing discussions. In doing so, each nation will be able to identify the successes and "best practices" that could serve as guides for successful replication of programs and funding.

The fact that both nations are pursuing similar courses offers substantial opportunity for great cooperation between the U.S. and Korea to advance these shared goals.

- There should be an ongoing exchange of scientific and technical knowledge to assist each nation in achieving its goal of a clean energy economy. Thus, researchers in universities, laboratories, and government agencies of both nations should be in contact with each other regarding developments and advances.
- Government policymakers of both nations need to be in conversation with each other in order to discuss the obstacles and challenges facing the adoption of clean energy policies. Each may have lessons to share (and learn) from the other as we seek to adopt what may often be seen as controversial and divisive energy policies.
- Both South Korea and the U.S. have witnessed a tremendous growth in clean energy technologies. This should offer some expanded opportunities for trade between the two nations.
- The bilateral consultations on energy policy that the two governments initiated in 2007 serve as a useful channel for the two governments to identify areas for cooperation.

Finally, the American Chamber of Commerce in Korea offered its own perspectives on policy recommendations for the Obama Administration, and they are particularly relevant for both nations.

- Approve and implement the U.S.-Korea Free Trade Agreement at the earliest possible time.
- Continue the dialogue with Korea on bilateral trade and investment issues.
- Include the private sector in bilateral U.S.-Korea government dialogues on energy policy and energy security issues.
- Establish and maintain regular, high-level discussions with Korean officials on matters of mutual interest, including global economic issues.
- Consider how the business community, when appropriate, can support positive change in North Korea and help respond to potential humanitarian crises.

All in all, the opportunities to create a national "clean energy economy" as well as a global "clean energy economy" seem promising if the advances by numerous nations in recent years are any indication of lies ahead. Through further cooperation between the Republic of Korea and the United States, it is conceivable that both nations will be able to lead the rest of the world in developing and implement a "clean energy economy" that is beneficial to all inhabitants of the planet.

APPENDICES

BARACK OBAMA AND JOE BIDEN: NEW ENERGY FOR AMERICA

America has always risen to great challenges, and our dependence on oil is one of the greatest we have ever faced. It's a threat to our national security, our planet and our economy. For decades, Washington has failed to solve this problem because of partisanship, the undue influence of special interests, and politicians who would rather propose gimmicks to get them through an election instead of long-term solutions that will get America closer to energy independence.

Our country cannot afford politics as usual – not at a moment when the energy challenge we face is so great and the consequences of inaction are so dangerous. We must act quickly and we must act boldly to transform our entire economy – from our cars and our fuels to our factories and our buildings.

Achieving this goal will not be easy. Energy independence will require far more than the same Washington gimmicks and continued dependence on costly and finite resources. It will require a sustained and shared effort by our government, our businesses, and the American people. But America has overcome great challenges before. With clarity of direction and leadership, there is no question that we possess the insight, resources, courage and the determination to build a new economy that is powered by clean and secure energy.

Barack Obama and Joe Biden have a comprehensive energy plan that provides immediate relief to struggling families. It also summons the nation to face one of the great challenges of our time: confronting our dependence on foreign oil, addressing the moral, economic and environmental challenge of global climate change, and building a clean energy future that benefits all Americans.

The Obama-Biden comprehensive New Energy for America plan will:

- Provide short-term relief to American families facing pain at the pump
- Help create five million new jobs by strategically investing $150 billion over the next ten years to catalyze private efforts to build a clean energy future.
- Within 10 years save more oil than we currently import from the Middle East and Venezuela combined
- Put 1 million Plug-In Hybrid cars – cars that can get up to 150 miles per gallon – on the road by 2015, cars that we will work to make sure are built here in America
- Ensure 10 percent of our electricity comes from renewable sources by 2012, and 25 percent by 2025
- Implement an economy-wide cap-and-trade program to reduce greenhouse gas emissions 80 percent by 2050

SHORTTERM SOLUTIONS: IMMEDIATE RELIEF FROM PAIN AT THE PUMP
Barack Obama and Joe Biden recognize that skyrocketing energy costs are taking a heavy toll on American families. To address the squeeze on Americans, they are calling for an: emergency energy rebate; an aggressive plan to crack down on speculators; and a swap of oil from the Strategic Petroleum Reserve to help provide immediate relief from soaring energy prices.

- ***Immediately Provide Emergency Energy Rebate*.** Barack Obama and Joe Biden will require oil companies to take a reasonable share of their record-breaking windfall profits and use it to provide direct relief worth $500 for an individual and $1,000 for a married couple. The relief would be delivered as quickly as possible to help families cope with the rising price of gasoline, food and other necessities. The rebates would be fully paid for with five years of a windfall profits tax on record oil company profits. This relief would be a down payment on the Obama-Biden long-term plan to provide middle-class families with at least $1,000 per year in permanent tax relief. The Obama-Biden energy rebates will: offset the entire increase in gas prices for a working family over the next four months; or pay for the entire increase in winter heating bills for a typical family in a cold-weather state. In addition, Barack Obama and Joe Biden have proposed setting aside a portion of a second round of fiscal stimulus to ensure sufficient funding for home heating and weatherization assistance as we move into the fall and winter months.

- ***Crack Down on Excessive Energy Speculation***. Current loopholes in Commodity Futures Trading Commission regulations have contributed to the skyrocketing price of oil on world markets. Barack Obama and Joe Biden will enact simple legislation to close these loopholes and increase transparency on the market to help bring oil prices down and prevent traders from unfairly lining their pockets at the expense of the American people.

- ***Swap Light and Heavy Crude, Release Oil from Strategic Petroleum Reserve to Cut Prices.*** The United States' Strategic Petroleum Reserve (SPR) is there for a purpose: to help Americans in times of crisis. Barack Obama and Joe Biden believe the doubling of oil prices in the past year is a crisis for millions of Americans and the transfer of wealth to oil producing countries, many of them hostile to our interests, is a threat to our national security. With the goal of bringing down prices at the pump, they support releasing light oil from the SPR now and replacing it later with heavier crude more suited to our long-term needs.

MID TO LONGTERM SOLUTIONS: NEW ENERGY FOR AMERICA
Our nation is confronted by two major energy challenges –our dependence on foreign oil and global climate change – both of which stem from our current dependence on fossil fuels for energy. Barack Obama and Joe Biden believe we have a moral, environmental, economic, and security imperative to address our dependence on foreign oil and tackle climate change in a serious, sustainable manner.

Tackle Climate Change
As a result of climate change, the polar ice caps are shrinking causing sea levels to rise; extreme weather is wreaking havoc across the globe; droughts are becoming more severe, tropical diseases are migrating north and numerous species are being threatened with extinction.

• ***Implement Cap and Trade Program to Reduce Greenhouse Gas Emissions.*** Barack Obama and Joe Biden support implementation of an economy-wide cap-and-trade system to reduce carbon emissions by the amount scientists say is necessary: 80 percent below 1990 levels by 2050. This market mechanism has worked before and will give all American consumers and businesses the incentives to use their ingenuity to develop economically effective solutions to climate change. The Obama-Biden cap-and-trade policy will require all pollution credits to be auctioned. A 100 percent auction ensures that all industries pay for every ton of emissions they release, rather than giving these valuable emission rights away to companies on the basis of their past pollution. A small portion of the receipts generated by auctioning allowances ($15 billion per year) will be used to support the development of clean energy, invest in energy efficiency improvements, and help develop the next generation of biofuels and clean energy vehicles – measures that will help the economy and help meet the emissions reduction targets. It will also be used to provide new funding to state and federal land and wildlife managers to restore habitat, create wildlife migration corridors, and assist fish and wildlife to adapt to the effects of a warming climate. All remaining receipts will be used for rebates and other transition relief to ensure that families and communities are not adversely impacted by the transition to a new energy, low carbon economy.

- ***Make the U.S. a Leader on Climate Change.*** Barack Obama and Joe Biden understand that the only real solution to climate change requires all major emitting nations to join in the solution. While it is time for America to lead, developing nations like China and Brazil must not be far behind in making their own binding commitments. To develop an effective and equitable global program, Barack Obama and Joe Biden will re-engage with the U.N. Framework Convention on Climate Change (UNFCC) – the main international forum dedicated to addressing the climate problem. They will also invigorate the Major Economies (MEM) effort and bring all the major emitting nations together to develop effective emissions reduction efforts.

Invest in Our Secure Energy Future and Create 5 Million New Jobs

Barack Obama and Joe Biden will use a portion of the revenue generated from the cap-and-trade permit auction to make investments that will reduce our dependence on foreign oil and accelerate deployment of low-carbon technologies. The investments will focus on three critical areas: 1) Basic Research; 2) Technology Demonstration and 3) Aggressive Commercial Deployment and Clean Market Creation.

- ***Invest In A Clean Energy Economy and Help Create 5 Million New Green Jobs*.** Barack Obama and Joe Biden will strategically invest $150 billion over 10 years to accelerate the commercialization of plug-in hybrids, promote development of commercial scale renewable energy, encourage energy efficiency, invest in low emissions coal plants, advance the next generation of biofuels and fuel infrastructure, and begin transition to a new digital electricity grid. The plan will also invest in America's highly-skilled manufacturing workforce and manufacturing centers to ensure that American workers have the skills and tools they need to pioneer the green technologies that will be in high demand throughout the world. All together these investments will help the private sector create 5 million new green jobs, good jobs that cannot be outsourced.

- ***Create a "Green Vet Initiative".*** The renewable energy economy is exploding in the United States. In terms of venture capital alone, private investment in the sector topped $2.6

billion dollars in 2007. At the same time, more than 837,000 troops who served in Iraq or Afghanistan are now veterans. Barack Obama and Joe Biden will ensure that more of our veterans can enter the new energy economy. They will create a new "Green Vet Initiative" that will have two missions: first it will offer counseling and job placement to help veterans gain the skills to enter this rapidly growing field; second, it will work with industry partners to create career pathways and educational programs.

- ***Convert our Manufacturing Centers into Clean Technology Leaders.*** America boasts the highest-skilled manufacturing workforce in the world and advanced manufacturing facilities that have powered economic growth in America for decades. Barack Obama and Joe Biden believe that America companies and workers should build the high-demand technologies of the future, and he will help nurture America's success in clean technology manufacturing by establishing a federal investment program to help manufacturing centers modernize and help Americans learn new skills to produce green products. This federal grant program will allocate money to the states to identify and support local manufacturers with the most compelling plans for modernizing existing or closed manufacturing facilities to produce new advanced clean technologies. This investment will help provide the critical up-front capital needed by small and mid-size manufacturers to produce these innovative new technologies. Along with an increased federal investment in the research, development and deployment of advanced technologies, this $1 billion per year investment will help spur sustainable economic growth in communities across the country.

- ***Create New Job Training Programs for Clean Technologies.*** The Obama-Biden plan will increase funding for federal workforce training programs and direct these programs to incorporate green technologies training, such as advanced manufacturing and weatherization training, into their efforts to help Americans find and retain stable, high-paying jobs. Barack Obama and Joe Biden will also create an energy-focused youth jobs program to invest in disconnected and disadvantaged youth. This program will provide youth participants with energy efficiency and environmental service opportunities to improve the energy efficiency of homes and buildings in their communities, while also providing them with practical skills and experience in important career fields of expected high-growth employment. Participants will not only be able to use their training to find new jobs, but also build skills that will help them move up the career ladder over time.

Make our Cars, Trucks and SUV's Fuel Efficient

Last year, oil provided more than 96 percent of the energy in our vehicles. It is an economic, national security and environmental imperative that this near-total dependence comes to an end. To achieve this goal, Barack Obama and Joe Biden will implement a strategy that will – within 10 years - allow us to reduce our consumption of oil by more than we currently import from the Middle East and Hugo Chavez's Venezuela combined. In order to do that, he will:

- ***Increase Fuel Economy Standards***. Barack Obama and Joe Biden will increase fuel economy standards 4 percent per each year while protecting the financial future of domestic automakers. The plan, which will save nearly a half trillion gallons of gasoline and 6 billion metric tons of greenhouse gases, will establish concrete targets for annual fuel efficiency increases while giving industry the flexibility to meet those targets.

- ***Invest in Developing Advanced Vehicles and Put 1 Million Plugin Electric Vehicles on the Road by 2015.*** As a U.S. senator, Barack Obama has led efforts to jumpstart federal investment in advanced vehicles, including combined plug-in hybrid/flexible fuel vehicles,

which can get over 150 miles per gallon of gas As president, Obama will continue this leadership by investing in advanced vehicle technology with a specific focus on R&D in advanced battery technology. The increased federal funding will leverage private sector funds and support our domestic automakers to bring plug-in hybrids and other advanced vehicles to American consumers. Barack Obama and Joe Biden will also provide a $7,000 tax credit for the purchase of advanced technology vehicles as well as conversion tax credits. And to help create a market and show government leadership in purchasing highly efficient cars, Barack Obama and Joe Biden will commit to:

  - Within one year of becoming President, the entire White House fleet will be converted to plug-ins as security permits; and
  - Half of all cars purchased by the federal government will be plug-in hybrids or all-electric by 2012

- ***Partner with Domestic Automakers.*** Barack Obama and Joe Biden will also provide $4 billion retooling tax credits and loan guarantees for domestic auto plants and parts manufacturers, so that the new fuel-efficient cars can be built in the U.S. by American workers rather than overseas. This measure will strengthen the U.S. manufacturing sector and help ensure that American workers will build the high-demand cars of the future.

- ***Mandate All New Vehicles are Flexible Fuel Vehicles*.** Sustainably-produced biofuels can create jobs, protect the environment and help end oil addiction – but only if Americans drive cars that will take such fuels. Barack Obama and Joe Biden will work with Congress and auto companies to ensure that all new vehicles have FFV capability – the capability by the end of his first term in office.

- ***Develop the Next Generation of Sustainable Biofuels and Infrastructure***. Advances in biofuels, including cellulosic ethanol, biobutenol and other new technologies that produce synthetic petroleum from sustainable feedstocks offer tremendous potential to break our addiction to oil. Barack Obama and Joe Biden will work to ensure that these clean alternative fuels are developed and incorporated into our national supply as soon as possible. They will require at least 60 billion gallons of advanced biofuels by 2030. They will invest federal resources, including tax incentives and government contracts into developing the most promising technologies and building the infrastructure to support them

- ***Establish a National Low Carbon Fuel Standard*.** Barack Obama and Joe Biden will establish a National Low Carbon Fuel Standard (LCFS) to speed the introduction of low-carbon nonpetroleum fuels. The standard requires fuels suppliers in 2010 to begin to reduce the carbon of their fuel by 5 percent within 5 years and 10 percent within 10 years. The Obama-Biden plan will incentivize increased private sector investment in advanced low-carbon fuels and has a sustainability provision to ensure that increased biofuels production does not come at the expense of environmental conservation. The LCFS is an important mechanism in ensuring that our efforts to reduce our oil dependence also reduce carbon emissions.

Promote the Supply of Domestic Energy

With 3 percent of the world's oil reserves, the U.S. cannot drill its way to energy security. But U.S. oil and gas production plays an important role in our domestic economy and remains critical to prevent global energy prices from climbing even higher. There are several key opportunities to support increased U.S. production of oil and gas that do not require opening up currently protected areas.

- ***A "Use it or Lose It" Approach to Existing Leases*.** Oil companies have access to 68 million acres of land, over 40 million offshore, which they are not drilling on. Drilling in open areas could significantly increase domestic oil and gas production. Barack Obama and Joe Biden will require oil companies to diligently develop these leases or turn them over so that another company can develop them.
- ***Promote the Responsible Domestic Production of Oil and Natural Gas*.** Barack Obama and Joe Biden will set up a process for early identification of any infrastructure obstacles/shortages or possible federal permitting process delays to drilling in:
    - o Bakken Shale in Montana and North Dakota which could have as much as 4 billion recoverable barrels of oil according to the U.S. Geological Survey.
    - o Unconventional natural gas supplies in the Barnett Shale formation in Texas and the Fayetteville Shale in Arkansas.
    - o National Petroleum Reserve-Alaska (NPR-A) which comprises 23.5 million acres of federal land set aside by President Harding to secure the nation's petroleum reserves for national security purposes.

- ***Prioritize the Construction of the Alaska Natural Gas Pipeline.*** Barack Obama and Joe Biden will work with stakeholders to facilitate construction of the pipeline. While this pipeline was proposed in 1976, and Congress authorized up to $18 billion in loan guarantees for this project in 2004, there has been no progress in building this critical energy infrastructure under the Bush Administration. The planned pipeline would have a daily capacity of 4 billion cubic feet of natural gas, or almost 7 percent of current U.S. consumption. Not only is this pipeline critical to our energy security, it will create thousands of new jobs.

- ***Getting More from our Existing Oil Fields.*** Nationally, experts believe that up to 85 billion barrels of technically recoverable oil remains stranded in existing fields. Enhanced oil recovery (EOR) using carbon dioxide offers an immediate- to medium-term opportunity to produce more oil from existing fields. And in the EOR process, large quantities of CO2 can be sequestered underground, reducing global warming pollution. Under an Obama Administration, we will pass a carbon cap-and-trade-bill, which will incentivize emitters to send their CO2 to old oil fields for EOR, thereby providing economic benefits while also stimulating additional domestic oil and gas production. To speed that process, we will map all stationary CO2 sources and develop a database to help industry calculate the most cost-effective oil field destination for each source's CO2.

Diversify Our Energy Sources

There are no silver bullet solutions to our energy crises. Our economy, security and environment will be best served through a sustained effort to diversify our energy sources. Barack Obama and Joe Biden will:

- ***Require 10 Percent of Electricity to Come from Renewable Sources by 2012*.** Barack Obama and Joe Biden will establish a 10 percent federal Renewable Portfolio Standard (RPS) to require that 10 percent of electricity consumed in the U.S. is derived from clean, sustainable energy sources, like solar, wind and geothermal by 2012. Many states are already well on their way to achieving statewide goals and it's time for the federal government to provide leadership for the entire country to support these new industries. This national requirement will spur significant private sector investment in renewable sources of energy and create thousands of new American jobs, especially in rural areas. And

Barack Obama and Joe Biden will also extend the federal Production Tax Credit (PTC) for 5 years to encourage the production of renewable energy.

- ***Develop and Deploy Clean Coal Technology.*** Carbon capture and storage technologies hold enormous potential to reduce our greenhouse gas emissions as we power our economy with domestically produced and secure energy. As a U.S. Senator, Obama has worked tirelessly to ensure that clean coal technology becomes commercialized. An Obama administration will provide incentives to accelerate private sector investment in commercial scale zero-carbon coal facilities. In order to maximize the speed with which we advance this critical technology, Barack Obama and Joe Biden will instruct DOE to enter into public private partnerships to develop 5 "first-of-a-kind" commercial scale coal-fired plants with carbon capture and sequestration.
- ***Safe and Secure Nuclear Energy.*** Nuclear power represents more than 70 percent of our noncarbon generated electricity. It is unlikely that we can meet our aggressive climate goals if we eliminate nuclear power as an option. However, before an expansion of nuclear power is considered, key issues must be addressed including: security of nuclear fuel and waste, waste storage, and proliferation. Barack Obama introduced legislation in the U.S. Senate to establish guidelines for tracking, controlling and accounting for spent fuel at nuclear power plants. To prevent international nuclear material from falling into terrorist hands abroad, Obama worked closely with Sen. Dick Lugar (R-IN) to strengthen international efforts to identify and stop the smuggling of weapons of mass destruction. As president, Obama will make safeguarding nuclear material both abroad and in the U.S. a top anti-terrorism priority. In terms of waste storage, Barack Obama and Joe Biden do not believe that Yucca Mountain is a suitable site. They will lead federal efforts to look for safe, long-term disposal solutions based on objective, scientific analysis. In the meantime, they will develop requirements to ensure that the waste stored at current reactor sites is contained using the most advanced dry-cask storage technology available.

Commitment to Efficiency to Reduce Energy Use and Lower Costs

According to the United Nations, America is only the 22nd most energy efficient country among the major economies in the world, which means we spend more on energy than we need to because our lifestyle and our built environment are wasting too much excess energy. Since 1973, the average amount of electricity each of us uses has tripled. We can do better. An Obama administration will strive to make America the most energy efficient country in the world.

- ***Deploy the Cheapest, Cleanest, Fastest Energy Source – Energy Efficiency.*** The Department of Energy (DOE) projects that demand for electricity will increase by 1.1 percent per year over the next few decades. Cutting this demand growth through efficiency is both possible and economically sound. Barack Obama will set an aggressive energy efficiency goal—to reduce electricity demand 15 percent from DOE's projected levels by 2020. Implementing this program will save consumers a total of $130 billion, reduce carbon dioxide emissions by more than 5 billion tons through 2030, and create jobs. A portion of this goal would be met by setting annual demand reduction targets that utilities would need to meet. The rest would come from more stringent building and appliance standards.

- ***Set National Building Efficiency Goals*.** Barack Obama and Joe Biden will establish a goal of making all new buildings carbon neutral, or produce zero emissions, by 2030. They will also establish a national goal of improving new building efficiency by 50 percent and existing building efficiency by 25 percent over the next decade to help us meet the 2030 goal.

- ***Overhaul Federal Efficiency Standards.*** The current Department of Energy has missed 34 deadlines for setting updated appliance efficiency standards, which has cost American consumers millions of dollars in unrealized energy savings. Barack Obama and Joe Biden will overhaul this process for appliances and provide more resources to his Department of Energy so it implements regular updates for efficiency standards. They will also work with Congress to ensure that it continues to play a key role in improving our national efficiency codes.

- ***Reduce Federal Energy Consumption*.** Currently, the federal government is the world's largest single consumer of energy in the world, spending approximately $14.5 billion on energy consumption in FY 2008. Barack Obama and Joe Biden believe in the importance of leading by example. They will make the federal government a leader in the green building market, achieving a 40 percent increase in efficiency in all new federal buildings within five years and ensuring that all new federal buildings are zero-emissions by 2025. They will invest in cost-effective retrofits to achieve a 25 percent increase in efficiency of existing federal buildings within 5 years. The Obama- Biden plan will put forward the resources necessary to achieve a 15 percent reduction in federal energy consumption by 2015.

- ***Flip Incentives to Energy Utilities.*** An Obama administration will "flip" incentives to utility companies by: requiring states to conduct proceedings to implement incentive changes; and offering them targeted technical assistance. These measures will benefit utilities for improving energy efficiency, rather than just from supporting higher energy consumption. This "regulatory equity" starts with the decoupling of profits from increased energy usage, which will incentivize utilities to partner with consumers and the federal and state governments to reduce monthly energy bills for families and businesses. The federal government under an Obama administration will play an important and positive role in flipping the profit model for the utility sector so that shareholder profit is based on reliability and performance as opposed to total production .

- ***Invest in a Smart Grid.*** Achieving these aggressive energy efficiency goals will require significant innovation in the way we transmit electricity and monitor its use. Barack Obama and Joe Biden will pursue a major investment in our national utility grid using smart metering, distributed storage and other advanced technologies to accommodate 21st century energy requirements: greatly improved electric grid reliability and security, a tremendous increase in renewable generation and greater customer choice and energy affordability. They will establish a Grid Modernization Commission to facilitate adoption of Smart Grid practices across the nation's electricity grid to the point of general adoption and ongoing market support in the U.S. electric sector. They will instruct the Secretary of Energy to: (1) establish a Smart Grid Investment Matching Grant Program to provide reimbursement of one-fourth of qualifying Smart Grid investments; (2) conduct programs to deploy advanced techniques for managing peak load reductions and energy efficiency savings on customer premises from smart metering, demand response, distributed generation and electricity storage systems; and (3) establish demonstration projects specifically focused on advanced technologies for power grid sensing, communications, analysis, and power flow control, including the integration of demand-side resources into grid management.

- ***Weatherize One Million Homes Annually*.** In the struggle with higher energy prices low income families are suffering the most and receiving the least attention. Across the nation, poor families this winter will increasingly face the choice between heating and eating as prices for natural gas, heating oil, propane and electricity skyrocket. To address the immediate challenge this winter, we must fully fund LIHEAP and ensure that everyone who needs it has access to heating assistance. Over the longer-term, a significant part of the answer for low income families is home weatherization. By upgrading a home's furnace, sealing leaky ducts, fixing windows, and adding insulation we can cut energy bills by 20 - 40 percent and the substantial savings accrue with summer air conditioning as well as winter heating. And by adding energy efficient appliances and lighting the savings are even greater. While the nation has weatherized about 5.5 million low income homes since 1976, more than 28 million remain eligible. Barack Obama and Joe Biden will make a national commitment to weatherize at least one million low-income homes each year for the next decade, which can reduce energy usage across the economy and help moderate energy prices for all.

- ***Build More Livable and Sustainable Communities.*** Over the long term, we know that the amount of fuel we will use is directly related to our land use decisions and development patterns. For the last 100 years, our communities have been organized around the principle of cheap gasoline. Barack Obama and Joe Biden believe that we must devote substantial resources to repairing our roads and bridges. They also believe that we must devote significantly more attention to investments that will make it easier for us to walk, bicycle and access other transportation alternatives. They are committed to reforming the federal transportation funding and leveling employer incentives for driving and public transit.

Source: The Barack Obama Campaign – Fact Sheet on Energy -- http://www.barackobama.com/pdf/factsheet_energy_speech_080308.pdf]

See also: "Renewing America's Promise: The Democratic National Platform 2008" http://s3.amazonaws.com/apache.3cdn.net/8a738445026d1d5f0f_bcm6b5l7a.pdf

Obama's Speech on Energy, Youngstown, Ohio, 5 August 2008

"We meet at a moment when this country is facing a set of challenges unlike any we've ever known. Right now, our brave men and women in uniform are fighting two different wars while terrorists plot their next attack. Our changing climate is putting our planet in peril and our security at risk. And our economy is in turmoil, with more and more of our families struggling with rising costs, falling incomes and lost jobs.

So we know that this election could be the most important of our lifetime. We know that the choices we make in November and over the next few years will shape the next decade, if not the century. And central to each of these challenges is the question of what we will do about our addiction to foreign oil.

Without a doubt, this addiction is one of the most urgent threats we've ever faced – from the gas prices that are wiping out your paychecks and straining businesses, to the jobs that are disappearing from this state; from the instability and terror bred in the Middle East, to the rising oceans, record drought and spreading famine that could engulf our planet.

Now how, exactly, did we get to this point? Well, you won't hear me say this too often, but I couldn't agree more with the explanation that Senator McCain offered a few weeks ago. He said, "Our dangerous dependence on foreign oil has been thirty years in the making, and was caused by the failure of politicians in Washington to think long-term about the future of the country."

What Senator McCain neglected to mention was that during those thirty years, he was in Washington for twenty-six of them. And during that time, he voted against increased fuel efficiency standards and opposed legislation that included tax credits for more efficient cars. He voted against renewable sources of energy. Against clean biofuels. Against solar power. Against wind power. Against an energy bill that – while far from perfect – represented the largest investment in renewable sources of energy in the history of this country.

And unfortunately, in this election, Senator McCain has proposed an energy plan that's nothing but four years more of the same.

He's offering a plan with no significant investments in alternative energy. He's offering a gas tax holiday that will pad oil company profits and save you – at best – half a tank of gas over the course of an entire summer. And he's offering $4 billion more in tax breaks to the biggest oil companies in America – including $1.2 billion to Exxon-Mobil, a company that just recorded the largest profit in the history of the United States. A company that, last quarter, made the same amount of money in 30 seconds that a typical Ohio worker makes in a year. All while here in Ohio, you're paying nearly $3.70 a gallon for gas – two and a half times what it cost when President Bush took office. Senator McCain not only wants oil companies to keep every dime of that money, he wants to give them more. Well, I don't know about you, but I don't think that's the change we need.

Instead of offering a real plan to lower gas prices, the only energy proposal he's really promoting is more offshore drilling. This plan won't lower prices today. It won't lower prices during the next Administration. The truth is, we wouldn't see a drop of oil from this drilling for at least seven years. While increased domestic oil exploration certainly has its place as we make our economy more fuel-efficient and transition to other, renewable, American-made sources of energy, it is not the solution. It is a political answer of the sort Washington has given us for three decades.

And while Senator McCain's plan won't save you at the pump anytime soon, it sure has done a lot to raise campaign dollars. Senator McCain raised more than one million dollars from the oil industry just last month, most of which came after he announced his plan for offshore drilling to a room full of cheering oil executives.

So to sum up, under Senator McCain's plan, the oil companies get billions more, we don't pay any less at the pump, and we stay in the same cycle of dependence on oil that got us into this crisis. The oil companies have placed their bet on Senator McCain, and if he wins, they will continue to cash in while our families and our economy suffer and our future is put in jeopardy.

That's the choice we face in this election. We can choose four years more of the same failed policies that have gotten us where we are. Four years more of oil companies calling the shots while hard working families are struggling. That's what Senator McCain is offering.
Or we can choose a new, clean energy future that gets us where we need to be. We can make a different bet – a bet on the ingenuity, industry and determination of the American people. That's what I'm offering.

Because after one president in the pocket of the oil companies – we can't afford another. For the sake of our economy, our security, and the future of our planet, we must end the age of oil in our time.

Now, we know our families need immediate relief from high gas prices – relief to the mother who's cutting down on groceries because of gas prices, or the man I met in Pennsylvania who lost his job and can't even afford to drive around and look for a new one. And if I'm elected President, unlike Senator McCain, I won't be giving tax breaks to oil companies that are doing better than ever while you're struggling more than ever. Instead, I'll immediately give working families across America a $1,000 energy rebate, paid for with part of the record profits the oil companies are making right now.

And in the short-term, as we transition to renewable energy, we can and should increase our domestic production of oil and natural gas. Right now, oil companies have access to 68 million acres where they aren't drilling. So we should start by giving them a choice: use the land you have, or give up your leases to someone who will.

But the truth is, neither of these steps will seriously reduce our energy dependence in the long-term. We simply cannot pretend, as Senator McCain does, that we can drill our way out

of this problem. Breaking our oil addiction will take nothing less than a complete transformation of our economy. It will take an all-hands-on-deck effort from America – effort from our scientists and entrepreneurs; from businesses and from every American citizen.

We all know that this is the great challenge of our time. If we fail to act, there the implications will be grave for our economy, for our security, for our planet.
But if we seize this moment, and meet the challenge, we can open to door to a new economy for the 21st century that will bring new energy, new jobs and new hope to Youngstown and communities across Ohio and this nation.

So if I am President, I will immediately direct the full resources of the federal government and the full energy of the private sector to a single, overarching goal – in ten years, we will eliminate the need for oil from the entire Middle East and Venezuela. To do this, we'll invest $150 billion over the next decade and leverage billions more in private capital to harness American energy and create five million new American jobs – jobs that pay well and won't be outsourced, good union jobs that lift up our families and revitalize our communities.

There are three major steps I will take to achieve this goal.

First, we'll commit ourselves to getting one million 150 mile-per-gallon plug-in hybrid cars on our roads within six years. And we'll make sure these cars are built not in Japan, not in China, but right here in the United States of America.

We'll do it by investing in research and development; providing $4 billion in loans and tax credits to auto companies so they can re-tool their factories to build these cars; and by giving consumers a $7,000 tax credit to buy them. That's how we'll make sure American workers and American companies can thrive in a 21st century economy.

Second, we'll double the amount of our energy that comes from renewable sources by the end of my first term. That means investing in the clean technology research and development that's occurring in facilities all across the country. It means investing in tax incentives to encourage the production of renewables like wind and solar power and to develop next generation biofuels. It means finding safer ways to use nuclear power and store nuclear waste, and to use more coal, ones of America's most abundant energy sources. And it means working to modernize our national utility grid so it can accommodate these new power sources without being overrun by blackouts.

The payoff from these investments in renewable energy sources will be renewable energy jobs across Ohio and across America. Now, I know that over the past eight years, you've lost more 236,000 manufacturing jobs in this state. But I also know that Ohio has the second highest potential of all fifty states to create new wind energy manufacturing jobs – and investing in wind power could increase workers' wages in Ohio by more than $3.5 billion through the year 2020. I also know that with the right investments, this state could save $24

billion a year that you spend importing energy, and instead, power two million homes using wind power.
Finally, I will call on businesses, government, and the American people to meet the goal of reducing our demand for electricity 15% by the end of the next decade. This is by far the fastest, easiest, and cheapest way to reduce our energy consumption – and it will save us $130 billion on our energy bills. One report found that right here in Ohio, improvements in energy efficiency can help save homes and businesses $1.5 billion in energy costs by 2020.

The state of California has implemented such a successful efficiency strategy that while electricity consumption grew 60% in this country over the last three decades, it didn't grow at all in California. There is no reason we can't do the same thing all across America.

In just ten years, these three steps will produce enough renewable energy to replace all the oil we import from the Middle East. Along with the cap-and-trade program I've proposed, we will reduce our dangerous carbon emissions 80% by 2050, slow the warming of our planet, and create five million new jobs in the process.

I won't pretend the goals I've laid out today aren't ambitious. They are. I won't pretend we can achieve them without cost, or without sacrifice, or without the contribution of almost every American citizen. We can't.

But I will say that these goals are possible. And I will say that achieving them is absolutely necessary if we want to keep America safe and prosperous in the 21st century. It's necessary if we want our families to thrive again – to have good jobs with good wages that let them get ahead again.

So in this election, we face a choice. We can continue down the path we've been traveling. We can keep making small, piece-meal investments in renewable energy, keep paying more and more at the pump, and keep sending our hard-earned dollars to oil company executives and Middle Eastern dictators. We can watch helplessly as the price of gas rises and falls because of some foreign crisis we have no control over, and uncover every single barrel of oil buried beneath this country only to realize that we don't have enough for a few years, let alone a century. We can watch other countries create the industries and jobs that will fuel our future, as our workers fall behind and our planet grows more unlivable by the day.

Or we can choose another future. In just a few years, we can watch cars that run on plug-in batteries come off our assembly lines. We can see shuttered factories open their doors to manufacturers that sell wind turbines and solar panels that will power our homes and our businesses. We can watch as millions of new jobs with good pay and good benefits are created for American workers, and we can take pride as the technologies, and discoveries, and industries of the future flourish in the United States of America. We can lead the world, secure our nation, and leave our children a planet that is safer and cleaner and healthier than the one we inherited.

This is the choice we face in the months ahead. This is the challenge we must meet. This is the opportunity we must seize – and this may be our last chance to seize it. So I ask you to join me, in November and in the years to come, to ensure that we will not only control our own energy, but once again control our own destiny, and forge a new and better future for the country that we love. Thank you."

[**Source**: Council on Foreign Relations -- http://www.cfr.org/publication/16903/]

New Science for a Secure and Sustainable Energy Future

Summary of a report of the Department of Energy Basic Energy Sciences Advisory Committee

The Energy Challenge

For a secure and sustainable energy future, the United States must reduce its dependence on imported oil, reduce its emissions of carbon dioxide and other greenhouse gases, and replace the economic drain of imported oil with economic growth based on exporting a new generation of clean energy technologies.

The cost and uncertainty of imported oil ($700B/yr at the peak, about $200B/yr currently) are major threats to the U.S. economy. Developing new competitive renewable energy resources will help solve our energy problems at home and create economic opportunity to market our solutions to the world.

The Science and Technology Solution

Changing our decades-long dependence on imported oil and unfettered emission of carbon dioxide requires fundamental changes in the ways we produce, store and use energy. This report identifies three strategic goals required to meet these challenges: (1) making fuels from sunlight, (2) generating electricity without carbon dioxide emissions, and (3) revolutionizing energy efficiency and use.

To meet these strategic challenges, the U.S. will have to create fundamentally new technologies with performance levels far beyond what is now possible. Such technologies, for example, may be able to convert sunlight to electricity with triple today's efficiency, store electricity in batteries or supercapacitors at ten times today's capacity, and produce electricity from coal and nuclear plants at twice today's efficiency while capturing and sequestering the carbon dioxide emissions and hazardous radioactive wastes.

Development of these advances will require scientific breakthroughs that come only with fundamental understanding of new materials and chemical processes that govern the transfer of energy between light, electricity, and chemical fuels. *Such breakthroughs will require a major national mobilization of basic energy research.* A working transistor was not developed until the theory of electronic behavior on semiconductor surfaces was formulated. Lasers could not be developed until the quantum theory of light emission by materials was understood. Similar breakthroughs can be achieved for sustainable energy, but only if we invest in basic research now.

Basic science stands at the dawn of an age in which matter and energy can be controlled at the electronic, atomic, and molecular levels. Materials can now be built with atom-by-atom precision, and advanced theory and computational models can predict the behavior of materials before they are made – opening new horizons for creating materials that do not occur in nature and are designed to accomplish specific tasks. These capabilities, unthinkable only 20 years ago, create unprecedented opportunities to revolutionize the future of sustainable energy. Transformational solutions to reducing imported oil dependency and carbon dioxide emission – from solar fuels, renewable electricity and carbon sequestration to batteries, solid-state lighting and fuel cells – require breakthroughs in the fundamental understanding and control of materials and chemical change.

Recommendations

To achieve these essential breakthroughs we need to fund a bold new initiative focused on solving the critical scientific roadblocks in next-generation carbon-free energy technologies. The solutions are within reach, using advanced materials and chemical phenomena that control matter and energy at the electronic, atomic and molecular level. To develop these solutions, we must recruit the best talent through workforce development and early career programs. We must establish "dream teams" of the best researchers and provide them the resources to tackle the most challenging problems.

For the full report, visit: http://www.sc.doe.gov/bes/reports/files/NSSSEF_rpt.pdf

Energy Frontier Research Centers Fact Sheet

• **DOE Energy Frontier Research Centers (EFRCs)** The EFRCs are a means to enlist the talents and skills of the very best American scientists and engineers to address current fundamental scientific roadblocks to U.S. energy security. (http://www.sc.doe.gov/bes/EFRC.html)
• The EFRCs will address energy and science "grand challenges" in a broad range of research areas; these "grand challenges" have been defined through a series of more than one dozen technical workshops conducted by the U.S. Department of Energy's (DOE) Office of Science over the past five years.
• Since 2003, the Basic Energy Sciences program within the Office of Science has organized numerous workshops (http://www.sc.doe.gov/bes/reports/list.html) in coordination with the Department's technology offices to explore significant topics in energy production, conversion, storage, transmission, and waste mitigation. These workshop reports have engaged more than 1,500 participants from universities, DOE national laboratories, and industry, and have identified high priority research directions with promise to address the most critical knowledge and technology gaps.
• The 46 EFRCs, to be funded at $2-5 million per year each for a planned initial five-year period, were selected from a pool of some 260 applications received in response to a Funding Opportunity Announcement (FOA) issued by the DOE Office of Science in 2008.
• Selection was based on a rigorous merit review process utilizing outside panels composed of scientific experts. This process is described in detail in the EFRC FOA.
• Thirty EFRCs are being funded at a total annual cost of $100 million under the Fiscal Year (FY) 2009 Federal Budget. The Recovery Act provided a further $277 million, enabling the Office of Science to establish an additional 16 EFRCs and forward-fund them for the full five-year period.
• In total, the EFRC initiative represents a planned DOE commitment of $777 million over five years, with the $400 million in out-year funding for the FY 2009 funded Centers subject to future appropriations.
• Of the 46 EFRCs selected, 31 are led by universities, 12 by DOE National Laboratories, two by nonprofit organizations, and one by a corporate research laboratory.
• There are 106 institutions, from 36 states plus the District of Columbia and 4 foreign countries, participating in the EFRC program.
• In all, they will involve nearly 700 senior investigators and employ, on a full- or part-time basis, an estimated 1100 researchers, including postdoctoral associates, graduate students, undergraduate students, and technical staff.
• Roughly a third of these will be supported by Recovery Act funding.
• EFRC researchers will take advantage of new capabilities in nanotechnology, high-intensity light sources, neutron scattering sources, supercomputing, and other advanced instrumentation, much of it developed with DOE Office of Science support over the past decade, in an effort to lay the scientific groundwork for fundamental advances in solar energy, biofuels, transportation, energy efficiency, electricity storage and transmission, clean coal and carbon capture and sequestration, and nuclear energy.

See the Dept. of Energy Energy Frontier Research Center Web site:
http://www.science.doe.gov/bes/EFRC.html

Harvard Project on International Climate Agreements

"An Elaborated Proposal for Global Climate Policy Architecture: Specific Formulas and Emission Targets for All Countries in All Decades," by Jeffrey Frankel.

Overview

This proposal builds on the foundations of the Kyoto Protocol, but strengthens it in important ways. It attempts to solve the most serious deficiencies of Kyoto: the absence of long-term targets, the absence of participation by the United States and developing countries, and the lack of motivation for countries to abide by their commitments. Although there are many ideas to succeed Kyoto, virtually all the existing proposals are based either on science (e.g., capping global concentrations at 450 ppm) or on the economics (weighing the economic costs of aggressive short-term cuts against the long-term environmental benefits). This plan for emissions reductions is more practical because it is partly based on politics, in addition to science and economics.

Discussion

The proposal calls for an international agreement to establish a global cap-and-trade system. The emissions caps are set using formulas that assign quantitative emissions limits to countries in every year until 2100. Three political constraints are particularly important in developing the formulas. First, developing countries are not asked to bear any cost in the early years. Second, even later, developing countries are not asked to make any sacrifice that is different from the earlier sacrifices of industrialized countries, accounting for differences in incomes. Third, countries are not asked to accept targets that cost more than 5% of GDP in any given year.

Under the formulas, rich nations immediately begin to make emissions cuts. Developing countries agree to maintain their business-as-usual emissions in the first decades, but over the longer term agree to binding targets that ultimately reduce emissions below business as usual. This structure precludes energy-intensive industries from moving operations to developing countries (so-called "carbon leakage") and gives industries a more even playing field. However, it still preserves developing countries' ability to grow their economies, and they can raise revenue by selling emission permits. In later decades, once developing countries cross certain income and emissions thresholds, their emissions targets become stricter, following a numerical formula. However, these emissions cuts are no greater than the cuts made by rich nations earlier in the century, accounting for differences in per-capita income, per-capita emissions, and baseline economic growth.

This system of targets results in a world price of carbon dioxide that reaches $30 per ton in 2020, $100 per ton in 2050, and $700 per ton in 2100, according to economic simulations using the WITCH climate model. Most countries sustain economic losses that are under 1% of GDP in the first half of the century, but then rise toward the end of the century. Atmospheric concentrations of CO2 stabilize at 500 ppm in the last quarter of the century, and world temperatures increase by about 3 degrees.

Key Findings and Recommendations

➢ *Any future climate agreement must comply with six important political constraints*. First, the US will not commit to quantitative targets if China and other major developing countries do not commit to quantitative targets at the same time, due to concerns about economic competitiveness and carbon leakage. Second, China and other developing countries will not make sacrifices different in character from those made by richer countries that have gone before them. Third, in the long run, no country can be rewarded for having "ramped up" its emissions high above the levels of 1990. Fourth, no country will agree to participate if, in any year, the present discounted value of its future expected costs is more than 1% of GDP. key findings & recommendations Fifth, no country will abide by targets that cost it more than 5% of GDP in any year. Sixth, if one major country drops out, others will become discouraged and the system may unravel.

➢ *Future emissions caps should be determined by a formula that incorporates three elements: a Progressivity Factor, a Latecomer Catch-up Factor, and a Gradual Equalization Factor*. The Progressivity Factor requires richer countries to make more severe cuts relative to their business-as-usual emissions. The Latecomer Catch-up Factor requires nations that did not agree to binding targets under Kyoto to make gradual emissions cuts to account for their additional emissions since 1990. This factor prevents latecomers from being rewarded with higher targets, or from being given incentives to ramp up their emissions before signing the agreement. Finally, the Gradual Equalization Factor addresses the fact that rich countries are responsible for most of the carbon dioxide currently in the atmosphere. During each decade of the second half of the century, this factor moves per capita emissions in each country a small step in the direction of the global average of per capita emissions.

Conclusion

The framework here allocates emission targets across countries in such a way that every country is given reason to feel that it is only doing its fair share. Furthermore, the framework – a decade-by-decade sequence of emission targets determined by a few principles and formulas – is flexible enough that it can accommodate major changes in circumstances during the course of the century.

Author

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For a full copy of the paper, see: http://belfercenter.ksg.harvard.edu/files/FrankelWeb4.pdf

Economic Growth From

Hoosier Homegrown Energy

Indiana's Strategic Energy Plan

energy.IN.gov

2006

VISION

Grow Indiana jobs and incomes by producing more of the energy we need from our own natural resources while encouraging conservation and energy efficiency.

GOALS

TRADE CURRENT ENERGY IMPORTS FOR FUTURE INDIANA ECONOMIC GROWTH

- Importing energy exports growth potential
- New plants bring new jobs
- Reduce energy dependency and increase reliability

PRODUCE ELECTRICITY, NATURAL GAS AND TRANSPORTATION FUELS FROM CLEAN COAL AND BIOENERGY

- Build needed new power plants using 'clean coal' technology
- Make gas from coal versus importing natural gas
- Unlock biomass and build on biofuels success

IMPROVE ENERGY EFFICIENCY AND INFRASTRUCTURE

- Create new tools and incentives
- Support flex-fuel fleets
- Strengthen/expand energy infrastructure (including rail)

WHAT WE NEED TO DO NOW

A listing of some of the steps that need to be taken to achieve the outlined goals is included at the end of this document.

SUMMARY

Hoosier Homegrown Energy has the potential to bring several thousand new, high-paying jobs and more reliable, competitively priced energy supplies.

A MESSAGE FROM THE GOVERNOR AND LT. GOVERNOR OF INDIANA

An Indiana economic comeback depends heavily on the successful development of our energy potential. First, we must maintain and extend our competitive advantage of reliable, low-cost power for industry. Secondly, we must generate more income here in Indiana from our energy production potential. A winning energy plan is thus a critical underpinning of our overall economic strategy.

Our Hoosier homegrown energy strategy is to grow Indiana jobs and incomes by producing more of the energy we need from our own natural resources, while encouraging conservation

and energy efficiency. This plan is the energy component of the state's "Accelerating Growth" economic plan and agricultural growth strategy.

Gasoline and diesel fuel prices at record levels, volatile natural gas prices and ongoing troubles in the Middle East present us with an historic opportunity: Substitute Indiana coal and biomass for current coal, natural gas and petroleum imports to supply the energy we need. Current-and projected-world energy prices make such homegrown alternatives economically viable, and we should seize this chance to make it happen.

Today, 75 percent of our energy expenditures leave the state in exchange for coal, natural gas and oil. However, new energy development in Indiana would bring large investments and thousands of jobs to the state, while ensuring us greater control over our energy future. These new plants-and the infrastructure to support them-will be funded by private industry. Government will support this investment through tax incentives, loan guarantees and efficient regulation. Future pollution controls are likely to make new clean coal and biomass plants even more economically viable than current energy sources.

Our strategic energy plan calls for Indiana to make a long-term commitment to meet much of its own energy needs through the greater use of our in-state resources.

In the late 19th and early 20th centuries, Indiana built its first big industrial powerhouse on top of huge underground stores of natural gas and fields of Illinois Basin coal and oil. Our economy and our social fabric were literally built on a foundation of homegrown energy.

This time, new technology will allow us to fully utilize Indiana coal and biomass to generate needed electricity, create synthetic gas from coal and biomass, turn our agricultural products into motor fuels, and unleash our ingenuity toward the goal of aggressive energy efficiency.

We will build and modernize the energy generation capacity we need to meet the needs of a growing Indiana economy and, if we like, export energy to our neighbors.

We will unleash the power of biomass and use our animal waste, agricultural products and landfills to produce clean, affordable gas. This fuel will power rural communities and create self-sustaining agricultural campuses where odor, waste and pollutants will be contained. And, Indiana intends to meet or even exceed the national goal of producing 25 percent of the energy we consume by the year 2025 from our own alternative sources.

The Midwest really can be the Middle East of biofuels. Our numerous new E85 pumps, more than a dozen new ethanol plants, the world's largest soy biodiesel facility, and the establishment of BioTown are evidence that we won't rest until Indiana is the nation's biofuels capital. Beyond the use of traditional grain for ethanol, Indiana will strive to be a leader in cellulosic ethanol. Cellulosic is the future of biofuels and can be maximized by Indiana's research universities like Purdue.

Thousands of new, high paying jobs in our state will be in mining, energy plant operations and

management. Our universities will train highly skilled workers to run sophisticated, computer driven power plants and to manage safer, new coal mines.

Our research universities, with funding from the state and from innovative new federal research and development programs, will find ways to make our homegrown energy more economical, while commercializing energy technology and creating high-wage energy jobs. Residential customers also will benefit from more aggressive efforts by their energy providers to help them use energy more efficiently.

Our state's large, industrial energy users already know it is simply good business to "spend a dime to save a dollar" through efficiency. This plan will help smaller, more typical Hoosier employers-often the most vulnerable to energy prices-to become more energy efficient as well.

In the 21st century, Indiana's powerhouse economy will once again be built upon a foundation of energy supply and manufacturing. This time it will be one that is cleaner, stronger and more lasting. It will give our children and their children more reliable, affordable energy. And, just as importantly, our new energy industry will create high-tech, high-paying jobs while making Indiana more energy independent and a major manufacturer of dependable, clean energy.

In the era after September 11, 2001, our President and the nation have placed a great deal of importance on creating energy independence. Indiana will play a significant role in helping the United States reduce its dependence on foreign oil, while creating a whole new advanced manufacturing sector. And the jobs and income that will come with it will be right here at home in Indiana!

Governor Mitchell E. Daniels, Jr. Lt. Governor Rebecca S. Skillman

GOAL: TRADE CURRENT ENERGY IMPORTS FOR FUTURE INDIANA ECONOMIC GROWTH

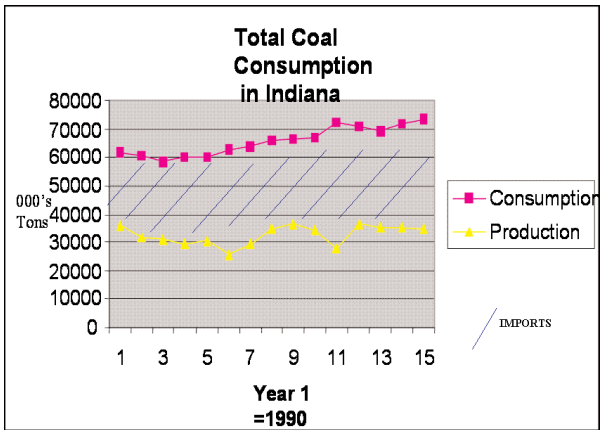
IMPORTING ENERGY, EXPORTING CAPITAL

Indiana will spend approximately $14 billion for imported energy in 2006 including natural gas, coal and petroleum.

Today, 75 percent of our energy expenditures leave the state in exchange for out-of-state coal, natural gas and oil products. This makes current Indiana consumers dependent on outside suppliers and hostage to whatever future energy prices we are charged. Importing energy and exporting capital does not increase energy investment in Indiana.

Consumers and businesses are suffering from increased costs. Workers are missing opportunities for employment. The state of Indiana is losing additional options to harvest economic growth and capital investment. The country as a whole is struggling with energy independence. What if we made much of the energy we need ourselves through a Hoosier homegrown energy policy?

In addition to direct economic benefits, a Hoosier homegrown strategy will reduce our dependency upon outside sources for basic energy needs. We cannot travel, live, prosper or create economic growth without a dependable, affordable and growing supply of energy. Making it here keeps the considerable investment required at home in Indiana.



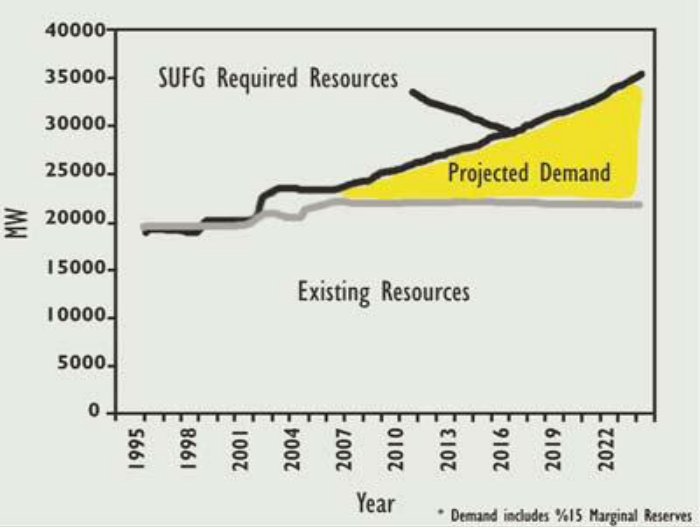
We will work with Indiana's energy providers and their regulators, the Indiana Utility Regulatory Commission (IURC) to continue their good work of keeping our lights on, pipelines full and prices competitive.

GOAL: PRODUCE ELECTRICITY, NATURAL GAS AND TRANSPORTATION FUELS FROM CLEAN COAL AND BIOENERGY

ELECTRICITY

Inexpensive coal has been a key reason for the relatively low electricity prices that Indiana has historically enjoyed. Our total electrical generation capacity has grown at a modest rate, and our estimated base load capacity now stands at 23,000 megawatts annually.

Currently, 13 percent of Indiana's generating capacity, and so-called "peaker" plants, run on imported natural gas. As natural gas prices rise these plants either do not generate electricity or do it expensively. This dependence on piped-in natural gas connects volatile natural gas prices with electricity prices. This linkage in Indiana's energy supply chain compounds the negative affect of volatile natural gas costs, placing pressure on both electricity and natural gas prices for home heating, commercial and industrial users.



Purdue University's State Utility Forecasting Group (SUFG) predicts that Indiana will need over 10,600 megawatts of additional electricity-the equivalent of 15 new baseload plants-by 2023. Building 15 new baseload plants is not practical and we must maximize our development of alternative energy and efficiency to achieve future needs. The SUFG estimates that Indiana will become a net importer of electricity in three years, forcing us to rely on outside markets that cannot be controlled by our energy producers.

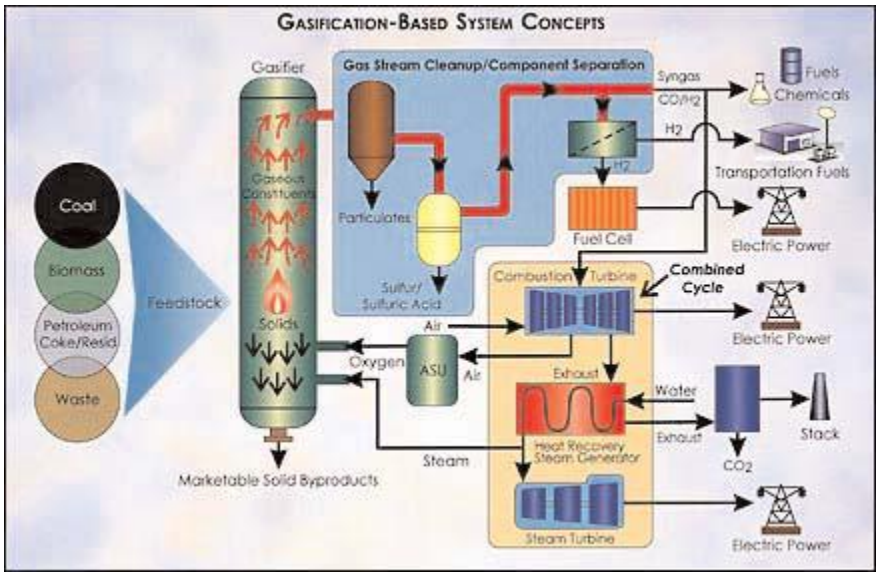
Currently, our most plentiful stocks of "ready energy," are abundant coal reserves. However, they are high in sulfur content, requiring expensive clean air technologies to use productively. While coal still supplies over 90 percent of electric generation in Indiana, over 50% of coal consumed comes from outside Indiana.

Therefore, Indiana should quickly develop clean energy opportunities to use our own coal before we increase the use of outdated plants and expensive pollution control technologies, to use coal imported from other states. This importation creates no economic advantage for Hoosiers.

Clean Coal Technology Is the Best Option

The best way to use our abundant coal reserves and meet the Environmental Protection Agency's (EPA) clean air mandates is to adopt clean coal technologies. While natural gas and petroleum prices have increased and fluctuated drastically, coal prices have remained steady.

By pursuing clean coal technologies and building new generation facilities, Indiana will enjoy new jobs resulting from the average per plant investment of over $1 billion. And, it will strengthen its hand from an economic development perspective, attracting outside earnings by exporting excess electricity.



Integrated Gasification Combined Cycle (IGCC)

Indiana will best use its coal reserves and rely less on imported coal through coal gasification, or Integrated Gasification Combined Cycle (IGCC). This process takes highly sulfuric coal and converts it to gas as a clean source of fuel to fire the generation of electricity. An example of this can be found in West Terre Haute at the Wabash River Gasification facility.

Fluidized Bed Technology

Fluidized Bed Combustion (FBC) is another combustion technology which may be used in Indiana power plants. Such plants are more flexible than conventional units because they can be fired on both coal and biomass, among other fuels, and provide more effective chemical reactions and heat transfer. Both IGCC and fluidized bed technologies show significant decreases in emissions of Sulfur Dioxide (SO2), Nitrogen Oxide (NOx), and increases the ability to capture more Carbon Dioxide (CO2) than current coal combustion techniques. Both will also be able to more easily accommodate new CO2 emission controls, if required. New clean coal projects are expensive investments and Indiana energy costs need to stay competitive to attract future economic development. Our current low electricity rates give us some cushion to make needed new investments, but we cannot rely solely on new coal development for all of our future megawatt production. Nonetheless, we have abundant coal reserves and will need to use them in a future of increasingly stringent environmental rules to help meet our growing electricity needs. These plants are by far the best environmental use of coal.

Unlock the Potential of Biomass

Electricity has long been provided by coal, petroleum and natural gas. However, new electric generating sources from biomass are becoming more economically viable. Biomass-to electric development uses processes like anaerobic digestion or waste gasification to make power. These technologies provide byproducts that can be used in fertilizer or as feed additives for

Indiana's expanding livestock base. As environmental pressures mount, new uses for these products will bring value-added opportunities to Indiana communities, particularly those whose waste streams are either land-filled or discarded as worthless. A current example of biomass use in Indiana is seen at several landfills using methane gas to make electricity.

Biomass conversion to electric will allow for expansion of Indiana's agriculture, food processing and other waste-producing ventures without increasing the amount of waste product for land filling or land application. Our abundant supply of waste streams, such as animal waste, landfill gas, and woody biomass will serve as key resources that will be readily available for energy development.

Realizing the potential of biomass energy, the State of Indiana is developing a unique concept in Reynolds, Indiana; also known as **BioTown, USA.** The long term expectation of the **BioTown, USA**, project is to completely meet all the energy needs of the town of Reynolds via biorenewable resources including electricity, natural gas replacement, and transportation fuel. Meeting the energy needs of this town with renewable sources will be the first success of its kind in the world, Bio Town, USA, uses environmentally friendly technologies that will convert animal and human waste to biogas, which translates into energy.

Maximize Indiana's Wind Energy Potential:

Wind power, electricity generated by capturing the wind's energy with modern wind turbines, is one of the lowest-cost, renewable electricity alternatives currently available.

Utility-scale wind farms can provide rural areas with significant investment and provide farmers with new sources of revenue by opening their land to new energy development, while at the same time allowing present farming activities to continue virtually unchanged.

Indiana possesses viable wind resources in limited pockets scattered across the northern half of the state. Wind power could provide the electricity capacity of a new baseload power plant within the next ten years. As wind power technology improves, wholesale markets increase and green energy becomes more valuable, Indiana can maximize its wind resources by selling wind power into markets with higher electricity costs. This would allow wind producers to find the best markets without jeopardizing Indiana's low electricity rates.

NATURAL GAS

Following nearly two decades of declining prices, natural gas costs skyrocketed nationally in the winter of 2000 and again in 2005. The increases hit homes and businesses hard. Since 1995, average natural gas prices have increased from about $2.00 per cubic foot, to $7-$8 per cubic foot today. And, prices are unlikely to return to pre-1995 levels.

The state of Indiana has significant natural gas resources that can be utilized to increase economic development and enhance the energy security of our state.

In contrast with the conventional natural gas resources, such as the largely depleted, turn-of-the-century Trenton Gas Field in northeastern Indiana, these resources are unconventional and are just now beginning to be developed. This development is taking place for two reasons:

1. The price of natural gas is now of a significant value that companies can economically utilize relatively expensive specialized drilling and completion technologies to produce the resource, and
2. These new technologies have been tested, tailored, and proven to be successful in Indiana's natural gas fields.

The volumes of natural gas located within the state are significant. Estimates are of 3-5 trillion cubic feet (TCF) potentially recoverable from coalbed methane (CBM) and 5-8 TCF from the New Albany Shale. For perspective: The state of Indiana consumes approximately 600 billion cubic feet (0.6 TCF) of gas per year. The potentially recoverable resource of unconventional gas located in the state is estimated at 8-13 TCF. This could be considered as a 13 to 22 year supply.

Coal to SYNGAS

Using local coal sources for synthetic gas production beyond electric generation would reduce our reliance on natural gas imports and should reduce costs for home heating and industry. Indiana could produce synthetic gas at home and reduce our reliance on volatile foreign suppliers like Venezuela, Bolivia and the Middle East, while keeping the economic benefits of such production here at home. Indiana still has substantial natural gas reserves locked under shale formations, but major economic and technology constraints continue to block their use in the near term.

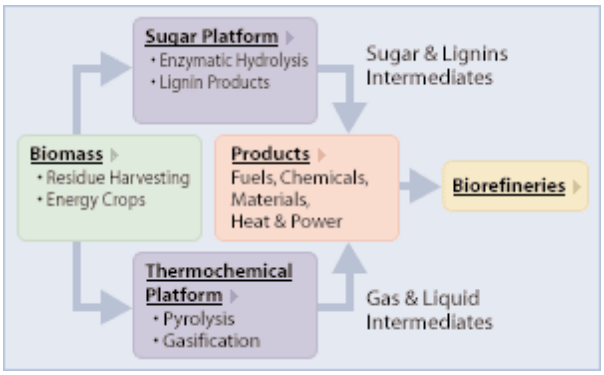
Synthetic natural gas plants are $1 billion capital investments that mirror the economic development potential of the clean coal electric plants. Once again, these plants would rely on local sources of energy and revitalize our coal industry, while creating new jobs and revenue in areas of the state hungry for economic development.

Biomass to Biogas

Biomass conversion can also help Indiana rely less on natural gas imports. There are now projects statewide that use animal waste, landfill gas and wood waste to offset the use of traditional natural gas imports.

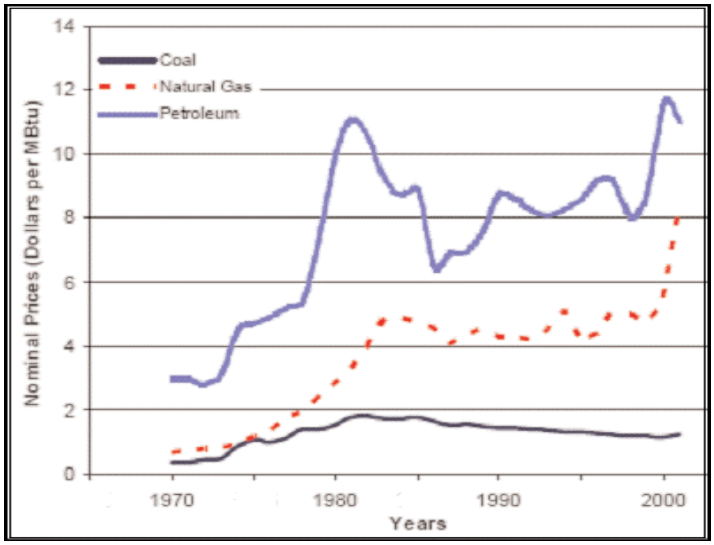
The same technologies used to produce electricity from biomass can be used to make biogas for natural gas replacement. Some biomass conversion units use Combined Heat and Power or CHP technology to make both electric and gas, making a closed loop process and allowing the user to rely less on traditional energy feedstocks and utility providers for energy.

Using waste streams to produce biogas also helps Indiana environmentally by turning once worthless products into value added resources. As with the BioTown initiative, we will maximize the use of both solid and liquid municipal waste to produce not only electricity but also natural gas replacement for home heating and manufacturing processes. Biomass conversion uses clean technologies with little emissions and removes environmental hazards by utilizing waste streams that may have been landfilled or stored in open lagoon systems.



Build "SYNGAS" Plants

The benefits from new synthetic gas production plants will be significant. First, Hoosiers will enjoy greater freedom from the current expensive, volatile natural gas markets. We will enjoy the direct benefits of using our natural feedstocks-coal and biomass, and the economic returns created by generating high value byproducts and pipeline quality gas will stay at home. Just three such plants could replace 25 percent of current residential and commercial natural gas consumption.



Natural gas has a volatile market that fluctuates drastically in price. Indiana is one of the states that relies the most on natural gas. Coal syngas offers Indiana a homegrown solution by developing syngas from Indiana coal. The syngas prices will then be based on coal prices, which are less volatile than natural gas prices.

Additionally, these plants would create a large jobs multiplier. Each plant would require a new coal mine with new industries providing a multiplier of 3.2 support jobs per one mine job.

TRANSPORTATION FUEL

A recent report by the President's Committee of Advisors on Science and Technology predicted that U.S. oil imports will approximately double between 1996 and 2030, from 8.5 million barrels per day, at a cost of $64 billion, to nearly 16 million barrels per day, at a cost of $120 billion. They estimated, however, that with concentrated efforts in fundamental energy research and investment in renewable fuel technologies, this could be reduced to 6 million barrels per day in 2030.

The nation has limited refinery capabilities though it is currently running its facilities at full capacity. The United States has not built new refineries in decades. At the same time, gasoline demand continues to increase. New demand for oil will be filled largely by the Middle East, meaning a transfer of more than $1 trillion over the next 15 years to the unstable states of the Persian Gulf alone. This will prove costly for Indiana consumers at the pump.

The cost for transportation fuels also is affected by regional environmental standards that require refineries to make multiple blends of gasoline to achieve air quality standards. The Federal Clean Air Act, which established emission standards for certain engines, sets fuel formulation requirements and requires emissions from transportation activities to be accounted for in states' plans to attain national ambient air quality standards. However, environmental agencies across the nation are concerned that progress made through cleaner burning fuels and low emission vehicles could soon be offset by increases in vehicle miles traveled.

Indiana produced an estimated 1.3 million barrels of petroleum in 2003. This is down substantially from just 10 years earlier, and represents only 3.7 percent of the petroleum our state consumes. On average, Indiana oil wells generate about one barrel of crude oil per well per day, making oil exploration a good opportunity for Hoosier oil producers, but not a fundamental solution to our problems.

Promote the Production of Synthetic Transportation Fuels

In the past 18 months Indiana has made enormous strides in using homegrown resources to replace the use of traditional transportation fuels. Our efforts in biofuels will not only help break our dependence on traditional fuels from abroad, but also will enhance economic development for our state's agricultural sector.

In the early days of his Administration, Governor Daniels emphasized the production and use of biofuels in the strategic plan for Indiana's agriculture sector. The Clean Indiana Energy Bill of 2005 and subsequent legislation in 2006 laid the groundwork for more biofuel production. The legislation provides incentives for new production facilities and gives tax credits to retailers who carry biofuels.

Along with production incentives, the state is aggressively promoting the use of biofuels via the Alternative Fuels Vehicle Grant program. It is offered through the Office of Energy and Defense Development in partnership with the Indiana State Department of Agriculture.

Build on Current Success in Biofuels Development

The economic benefits of ethanol for farmers and local governments are very substantial. Eleven ethanol plants will produce about 750 high-wage jobs in rural communities. Combined, these ethanol plants should provide about $1.5 billion in investment for the state. The Alternative Fuels Vehicle Grant program through the Office of Energy & Defense Development and the Indiana Department of Agriculture aggressively funded biofuels infrastructure in 2005. Indiana had zero E85 pumps in January of 2005, but now has more than 40 E85 pumps in commercial use, exceeding the original goal of 40 pumps by the end of 2006. This number makes Indiana one of the top five states in E85 retail availability.

Information about where to buy biofuels can be found at:
www.energy.in.gov/pumpmap

The recently enacted Federal biofuel mandate has created guaranteed demand for ethanol for the next several years, regardless of price.

Indiana is optimistic about the potential of corn-based ethanol, but realizes that to achieve the national target of 25 percent, or 60 billion gallons, we need to see a breakthrough in cellulosic ethanol. Advances in ethanol production efficiency and new feed stocks (corn stover, wood, switch grass, etc.) will be vital to making the fuel a lasting and economical substitute for petroleum.

Indiana is well positioned to become a top biodiesel producer in the nation. Our ranking as one of the country's top corn and soybean producers and our central location have created a tremendous opportunity to not only fully utilize Hoosier agricultural products, but also to improve air quality, create value-added byproducts and stimulate enormous investment in rural parts of Indiana.

At least three new biodiesel production facilities are being planned in the State at this time, and others are emerging. In March 2006, Indiana became the home of what will be the world's largest soy biodiesel facility in the world. This project will greatly enhance Indiana's economy while making us a leader in biodiesel production. In addition, Purdue University is a national leader in researching the use of highly refined soy byproducts.

Promote Cellulosic Ethanol Production-The Next Horizon

Indiana Senator Richard Lugar has been a leader in raising the discussion of energy policy in the country. In 1999, Senator Lugar wrote about the breakthroughs in genetic engineering and processing that are already leading today's efforts to convert virtually any plant or plant product, called cellulosic biomass, to produce ethanol fuel.

The raw material for cellulosic biomass is all around us. It is present in agricultural waste and in every plant, including wood, straw and grass.

Purdue University has achieved major breakthroughs in cellulosic biomass research making Indiana a true innovator in this area. Hoosier farmers and our rural economies stand to benefit from that innovation. Indiana will grow its own energy crops and harvest its own agricultural waste. Some experts have predicted that the global market for biofuels such as cellulosic ethanol will grow to exceed $10 billion by 2012. For Indiana, it means an increase in the value of farm crops which can lead to jobs and increased incomes. For example, corn stover left over from the harvest process can be processed into transportation fuel that would have the potential to pay back Hoosier farmers upwards of $130 per acre.

Convert Coal to Liquids

There are significant opportunities for the expanded use of coal as a means to replace crude oil for transportation fuels and chemicals by using coal-to-liquids (CTL) technology. The use of coal for this purpose can provide additional independence from oil imports, safeguard the nation's security, allow for the development of new industries, and provide new incentives for coal mining.

Through the Clean Fuel Initiative, authorized by Congress, the Pentagon is working at an urgent pace to significantly reduce its dependence on traditional fossil fuels, use cleaner fuels, and eventually develop a single battlefield fuel for its fleet. The U.S. military consumes 300,000 barrels of transportation fuel per day.

The Department of Defense (DOD) has a keen interest in securing alternatives to petroleum for reliable supplies of battlefield fuels and to reduce their dependence on foreign oils. Moreover, coal-derived fuels are superior for the production of ultra-clean diesel and jet fuel of interest to the aviation, heavy equipment and trucking industries. Illinois Basin coals, which are present in Indiana, are suitable feedstocks for these purposes.

Indiana will work to become a major source of that new fuel, relying primarily on our coal processing, but also looking for opportunities to utilize our significant oil shale, bio-fuels and other technologies. Estimates suggest that Indiana has the potential to create 20 billion barrels of oil equivalent from coal.

GOAL: IMPROVE ENERGY EFFICIENCY AND INFRASTRUCTURE

IMPROVING ENERGY EFFICIENCY

All levels and uses of energy are on the rise. At the same time, we are mindful of the impact of this growing use of energy on our environment. Indiana will be challenged to meet its energy needs while maintaining and improving environmental quality and keeping electricity prices relatively low. Effective and market-driven conservation measures will be important in achieving these goals.

Expanding on current energy efficiency efforts will keep money in Indiana and contribute to our local economies. We will continue to:

- Build name recognition among Indiana's residential, building and commercial sectors for ENERGY STAR products and practices through OED’s website, public events and partnerships with federal government and private industry.

- Put together a stronger energy efficiency culture in Indiana's energy intensive manufacturing sector through increased federal and state support for Purdue University's Technical Assistance Program (TAP) and the Clean Manufacturing Technology & Safe Materials Institute. Technical assistance and training from these programs will provide energy managers at manufacturing facilities, both large and small, with the necessary tools and knowledge to reduce their energy usage and costs, benefiting all Indiana sectors through reduced demand for electricity and natural gas.

- Maintain the work of the Governor's Heating Season Task Force to help Hoosiers who cannot pay their energy bills. The Governor expanded eligibility for the state's Energy Assistance Program (EAP) to include families whose incomes are at a level of 150 percent of poverty (up from 125 percent). This made assistance available to an additional 95,000 Hoosier households. To ensure full funding for the EAP through the winter heating season the Governor identified $10 million in Temporary Assistance for Needy Families funds to assist households eligible for bill assistance.

- Recognizing that rising natural gas prices were impacting more Hoosiers households then every before, Governor Daniels called for the creation of a public-private initiative that for the first time will provide assistance to families whose incomes are at 200 percent of the poverty level. The "Help Thy Neighbor" Heating Fund was created with a $5 million seed grant from the Lilly Endowment and a $1 million grant from the state's three largest gas utilities to give one-time bill assistance to Hoosiers who make between 150-200% of the poverty level and who have received a disconnect notice from their natural gas utility. Between January 1st and May 31st of 2006 the Help Thy Neighbor Heating Fund provided $3.3 million in bill assistance to more than 16,000 households across all 92 counties.
- Update building codes for public housing and other buildings to emphasize green technologies and methods.

STRENGTHEN INDIANA'S ENERGY INFRASTRUCTURE

The state will continue to work with the Midwest Independent System Operator (MISO), other transmission organizations, and energy providers to augment energy transportation systems as appropriate.

Electrical transmission constraints can represent a major challenge to reliable, competitive supplies, the development of competitive wholesale and retail supply markets and the development of renewable resources.

Since electricity cannot be stored, the transmission system must permit the sufficient movement of electricity by various suppliers when demand for electricity is at or near its peak. A transmission system incapable of unrestricted flows of electricity is a system at risk of allowing localized market power outages and extreme fluctuations in prices.

Transmission constraints have a direct impact on the supply of power to end-users. Regulatory siting requirements, zoning and resident opposition also act as a deterrent in the initiation of transmission improvement projects. Uncertainty, due to state and federal jurisdiction disputes and shifting federal transmission policy has, suppressed investment in new transmission. Without an efficient means of transmission there is little reason to build new generation capacity.

Pipeline infrastructure for coal and biomass-based synthetic fuels will be needed to supplement existing surface transportation (e.g. trucks and rail).

REVITALIZE RAIL INFRASTRUCTURE

One of the most frustrating structural barriers within Indiana's energy infrastructure is a bottleneck in our rail service routes between southern and northern parts of the state. Only one line linked the southern Indiana coalfields with the northern part of the state, and it did not directly serve the power plants that would eventually demand increasing supplies of coal. As a result, coal from western states has been more affordable. Due to diminishing transportation corridors and subsequent cost increases, this is no longer true. As Indiana coal once again becomes more marketable due to clean coal technology, we must make every effort to resolve this bottleneck and facilitate competitive shipments of coal north.

ENHANCE HUMAN CAPITAL TO SUPPORT ENERGY SECTOR

In order to support all of the State's energy initiatives, it will be critical that Indiana have the workforce to build and maintain them.

We will continue to work with state universities to further develop educational programs involving coal gasification, carbon sequestration, coal mining and renewable energy technologies applicable to Indiana to keep our best and brightest in Indiana working in energy related fields. The state will take the lead to recruit and train Hoosier talent for jobs in Indiana's energy sector. We'll follow a very similar strategy based on the exciting model we've constructed in the coal industry that includes education, training and promotion of the field.

Indiana can maximize jobs in the energy sector beyond renewable energy production through manufacturing. Manufacturing wind turbines, digesters, gasifiers and other renewable energy components can bring millions of dollars in new investment to Indiana. With an available workforce and the manufacturing infrastructure to supply the nation from the crossroads of America, Indiana should work to attract businesses making the systems for renewable energy development.

A recent study by the Renewable Energy Policy Project (REPP) estimates that Indiana has the greatest per capita, renewable energy job generation potential in the country.
(www.in.gov/energy/research/professionals/papers.html)

GROWTH & STEWARDSHIP THROUGH R & D

Indiana will compete for federal funding, promote innovation, and commercialize jobs from emerging energy technology. As a result, we will expand the state's 21st Century Research and Development Fund to target a dedicated portion to energy technology development and commercialization. We'll fully leverage federal opportunities, particularly those offered in the federal government's $1.3 trillion Energy Policy Act of 2005. The state must also engage and partner with our robust major research universities and defense assets such as Crane and other technology centers to optimize development of needed new technologies.

WHAT WE NEED TO DO NOW

- Use the Clean Indiana Energy Acts of 2005-06 to provide tax credits to qualifying clean coal utility and biofuel facilities.
    - Expand the Act to include non-utility clean coal and biomass investments using Indiana-based feed stocks.

- Seek federal tax credits and loan guarantees under 2005 U.S. Energy Policy Act (EPACT for Indiana energy facilities

- Assist energy supply and infrastructure projects in federal, state and local regulatory proceedings to attain needed permits, approvals and tariffs.

- Encourage non-utility power and other energy producers to accept the jurisdiction of the IURC to obtain the siting capability of utilities.

- Enhance the ability to site non-utility energy and infrastructure projects that contribute to the state's energy independence and system reliability.

- Develop policies to ease interconnection to the power grid by non-utility electricity producers.

- Develop 'up front' financial incentives for clean coal projects competitive with other Illinois Basin state incentives available to both utility and non-utility projects.

- Explore the creation of an 'Energy Corridor' of new pipeline, transmission infrastructure beneath the extended I-69 from the coal fields of Southwest Indiana north.

- Replace all State of Indiana fleet vehicles with flexible-fuel capable units as they are retired, with the goal of the entire fleet being flexible-fuel capable by 2010.

- Commit the State of Indiana to purchasing 10% of its electric load for all state government buildings in Marion County from renewable Indiana generators by 2010 and 25% by 2025.

- Insist that the Department of Local Government Finance require applicants seeking heating and cooling units for new buildings, additions and retrofits to compare long-term energy savings through geothermal heating and cooling systems, versus traditional natural gas or electric solutions.

- Use proceeds of the Clean Air Interstate Rule (CAIR) Nitrogen Oxide (NOx) Trading program to fund small and medium size efficiency and renewable energy projects.

- Provide incentives for energy efficiency investments that make power while maximizing the use of waste heat that also can be used in another process or for additional power, as well as fuel cells.

- Support alternative pricing regulatory mechanisms that encourage utilities to promote efficiency and conservation by their customers without incurring negative financial results.

- Encourage creative pricing mechanisms to ensure a reliable and reasonably priced energy supply, including interruptible rates, seasonal rate differentials and restructuring of fixed and variable charges.

- Use the Indiana Finance Authority's (IFA) "Volume Cap" funds to assist utility companies to help install new pollution prevention devices at coal-fired plants.

- Explore expanding the scope of "Volume Cap" dollars to also cover renewable energy investment, and/or include new clean coal development as pollution prevention.

- Support the National Action Plan for Energy Efficiency through gas and electric utilities, regulators and industry partners to create a sustainable, aggressive U.S. commitment to energy efficiency.

- Create an Interagency Council on Energy to coordinate the ongoing development and implementation of Indiana’s Strategic Energy Plan.

- Seek U.S. and private funding to enhance state support of major research universities to develop and demonstrate new energy supply and more efficient utilization technologies.

SUMMARY

Our new Hoosier Homegrown Energy plan commits Indiana to using new and emerging technologies to convert Indiana coal, corn, soy and other renewable sources to energy and reduce our dependency upon imports.

The payoff will be:

- **Thousands of new high paying jobs**
- **Economic and energy security**
- **A stronger hand in attracting new employers to our state**
- **More stable, affordable energy supplies for consumers**

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25x'25 Economic Recovery Proposals Supported by 'Real World' Benefits

25x'25 is a diverse alliance of agricultural, forestry, environmental, conservation and other organizations and businesses that are working collaboratively to advance the goal of securing 25 percent of the nation's energy needs from renewable sources by the year 2025. 25x'25 is led by a national steering committee composed of volunteer leaders. The 25x'25 goal has been endorsed by nearly 800 partners, 30 governors, 14 state legislatures and the U.S. Congress through The Energy Independence and Security Act, which was signed into law by President Bush on December 19, 2007. 25x'25 is a special project of the Energy Future Coalition (EFC). The EFC is a broad-based non-partisan public policy initiative that seeks to bring about change in U.S. energy policy to address overarching challenges related to the production and use of energy.

Editor's note: The following is the latest in a series of monthly feature stories from 25x'25 that highlight the challenges and opportunities presented by the pursuit of a renewable energy future. We encourage all partners to use all or any part of this feature in your internal or external communications. Media recipients should feel free to use this material in your efforts to cover this vastly complex issue.

As members of the 111th Congress and the new Obama administration consider a wide-ranging package of proposals aimed at bolstering the U.S. economy and creating new jobs, the National 25x'25 Steering Committee and a wide variety of its endorsing partners are working to bring to the attention of policymakers a series of recent recommendations that advocates believe will not only reverse the economic downturn, but insure a clean energy future.

Alliance partners say the recommendations all take aim at the objectives targeted by President Barack Obama and Congressional leadership in their efforts to address the ongoing economic downturn, including research, innovation funding for start-up businesses, financial assistance to established firms, infrastructure development and job growth, all in a wide variety of renewable energy sectors.

And partners say there is "real world" evidence of the benefits that come from the federal renewable energy programs targeted by these 12 recommendations, or in the case of new programs, hard evidence of the potential benefits. "The recommendations target programs that accelerate markets for the wind energy, solar power, biomass, geothermal energy, hydropower and biofuels industries," says Bart Ruth, 25x'25 policy committee chairman. "They represent the best opportunity to address our troubled economic times by implementing renewable-energy and energy-efficiency initiatives that can drive and maintain economic recovery."

Ruth says current projects that benefit from programs targeted by the recommendations or could benefit from new programs with adequate funding will serve as the evidence "that a renewable-energy and energy-efficient future will not only boost our economy, putting hundreds of thousands of people back to work, but also enhance our national security and improve our environment." He cites the national study undertaken by the University of Tennessee Department of Agricultural Economics that shows that if America's farms, ranches and forestlands are empowered with the policies and incentives needed to meet 25 percent of the nation's energy

needs with renewable resources – biofuels, biomass, wind energy, solar power, geothermal energy and hydropower – an estimated $700 billion in new, annual economic activity would be generated, and 4 million to 5 million new jobs would be created.

"The 25x'25 economic recovery recommendations will lead to a long-term, comprehensive energy development that will accelerate the production of all forms of renewable energy and create new renewable energy markets," said Ruth.

An examination of the types of projects targeted by the recommendations submitted to Congress and the new administration for a nationwide, clean energy economic recovery are estimated at $4.14 billion but show a wide range of initiatives, from small farmer-owned wind turbines to the development of large renewable energy markets promoted by some of America's largest corporations.

For example, the Rural Energy for America Program (REAP), authorized under Section 9007 of the Energy Title of the 2008 Farm Bill, provides grants or loan guarantees for renewable energy systems and energy efficiency improvements for agricultural producers and rural small businesses. The program, formerly known as the Section 9006 program, is currently funded at $255 million over four years, with additional annual authorization of $25 million. In existence since 2002, REAP is continuously oversubscribed and many valid projects are rejected because of limitations on USDA funding. The 25x'25 recommendations call for increased funding for REAP – up to $250 million annually, $500 million over two years – which advocates say will generate temporary construction jobs in rural America along with permanent jobs operating and maintaining renewable energy facilities.

A working example of the program is a wood pellet manufacturing facility recently opened in Appling County, GA. Built with the help of a $10-million, Section 9006 loan, the Appling County Pellets plant is producing up to 130,000 metric tons of wood pellets annually that are sold in domestic and international markets. Owned and operated by Fram Renewable Fuels LLC of Savannah, the biofuel mill near Baxley, GA started out with about 20 new full-time jobs, and plant owners hope to eventually generate more than 100 jobs to support forestry and shipping-related businesses.

For more on the Appling County facility, go to http://www.forestbioenergy.net/case-studies/CaseStudy3Fram.pdf and http://www.framfuels.com/news.html.

Another important program recommended for increased funding in the 25x'25 Economic Recovery Plan includes the Repowering Assistance Program, a new vehicle authorized under Section 9004 of the Energy Title of the 2008 Farm Bill. The program provides loans and loan guarantees to help biofuel plants convert their heating and power fuel supply to biomass and reduce their dependence on fossil fuel-powered boilers. The program is currently funded at $300 million over four years, but 25x'25 has called for $150 million annually over two years.

The technology is present to justify a boost in spending for the program, advocates say. Dallas-based Panda Ethanol Inc. is nearing completion of a 115-million gallon-per-year ethanol refinery in Hereford, TX. Unlike other plants that burn natural gas or coal to generate the steam used in

the ethanol manufacturing process, the Hereford facility will gasify up to 1 billion pounds of cattle manure per year and use the biogas to fuel the plant, conserving the energy equivalent of 1,000 barrels of oil a day. According to the Renewable Fuels Association, there are more than 150 biorefineries in operation today. With USDA assistance, many could be upgraded with biomass boilers using renewable energy technology like that planned for the Panda facility, a move that could generate construction and maintenance jobs, and contribute to cleaner air and environment. For more on the Panda plant, go to http://pandaethanol.com/about/index.html.

Another new program established under the Energy Title of the 2008 Farm Bill that 25x'25 says should receive increased funding is the Biorefinery Assistance Program. The funding vehicle provides loans and loan guarantees to assist with the construction of commercial-scale advanced biofuel facilities. As structured, the program also provides grants for demonstration-scale advanced biofuel plants. However, the 25x'25 recommendations contend that with the recent collapse of the credit markets, the program should be altered to provide grants for large-scale plants to produce cellulosic and other advanced biofuels. Advocates say the recession has slowed the conversion of existing grain-based ethanol plants to dual feedstock biofuels production facilities. The economic recession may therefore delay progress toward meeting cellulosic and advanced biofuels targets in the Renewable Fuels Standard and slow progress toward curtailing greenhouse gas emissions.

Additional funding for the Biorefinery Assistance Program – to $500 million in the first year and $1 billion in year two – and expanding use of the grants to facilitate the construction of second-generation biofuel plants, advocates say, will reduce investor risk and provide construction and operations jobs in rural communities. Serving as a roadmap for the federal program is a funding vehicle implemented by the state of Florida, a $25-million Department of Agriculture and Consumer Services program that provides matching grants to bio-energy firms for demonstration, commercialization and research and development projects utilizing Florida-grown biomass or crops. Verenium Corporation, one of the several firms across the country in the race to develop the first "next-generation" biofuels plant, is using a $7 million grant from Florida's "Farm to Fuel" initiative, to help build its first commercial-scale cellulosic ethanol facility in Highlands County, FL. Verenium's planned commercial facility will be the first in the state to use next-generation cellulosic ethanol technology to convert renewable grasses to fuel, rather than processing food crops. The plant is expected in 2011 to start producing the first of up to 36 million gallons of cellulosic ethanol per year and provide the region with about 140 full-time jobs. Additional jobs will be created during the 18-to-24 months of construction on the plant, which is estimated to cost between $250 and $300 million to build. For more on the Verenium plant, go to http://phx.corporate-ir.net/phoenix.zhtml?c=81345&p=RssLanding&cat=news&id=1244987.

Meanwhile, USDA is expected later this year to request proposals for funding under another new program, the Bioenergy Crop Assistance Program. BCAP is designed to support the establishment and production of eligible crops for conversion to bioenergy, and to assist agricultural and forest landowners with collection, harvest, storage, and transportation of these crops to conversion facilities. 25x'25 advocates say that without full and immediate funding of at least $250 million annually for two years, incentives will be lost to farmers to grow dedicated energy crops, restricting the availability of feedstocks and jeopardizing investments and threatening the commercial scale production of advanced biofuels.

The market for those next-generation feedstocks is showing viability: a California company last month launched the first seed sales of non-food, low-carbon crops developed specifically for biofuels and biopower. Ceres Inc. says it has begun booking orders for switchgrass and high-biomass sorghum seed, contending the product offers new options for growers, particularly on underperforming acres. For more on the Ceres line, go to http://www.ceres.net/News/NewsReleases/2008/12-11-08-News-Rel.html.

Elsewhere, a USDA Community Wood Energy Program authorized under the new farm bill is also recommended for full, $20-million funding for each of the first two years to provide grants to state and local governments and communities to develop wood energy plans. The grant would also allow for the acquisition or upgrade of community wood energy systems in communal facilities, such as schools, town halls, and libraries using woody biomass as a primary fuel. A working example of the types of projects targeted by the program is a wood-fired boiler heating system recently constructed by the city of Craig, AK, to supplement propane and oil heating systems for the municipal pool water, pool building, and elementary and middle school buildings. The new facility uses wood shavings, chips and dried planer shavings from local mills as fuel. Maintained by the Craig City School District, the system is expected to save $40,000-$60,000 per year and reduce the reliance on fossil fuels for heating. For more on the system, which will also help local mill owners by purchasing and utilizing wood waste generated by their manufacturing process, go to http://forestry.alaska.gov/pdfs/08DOF_AWEDTGBriefing.pdf.

The 25x'25 recommendations for increased funding go beyond USDA programs, also targeting vehicles like the Clean Renewable Energy Bonds (CREBs) provided under the Energy Policy Act of 2005. So-called "CREBs" provide electric cooperatives and public power systems with the ability to issue investment incentives comparable to the Production Tax Credit (PTC) that is available to investor-owned utilities but are denied by law to not-for-profit utilities, which serve 25 percent of the nation. CREBs support a wide variety of projects, including wind, biomass, geothermal, solar, municipal solid waste, small irrigation power, and hydropower. The program, which is already over-subscribed at $800 million in current mandatory spending, would be extended through 2010 and be given an additional bonding authority of $2.5 billion under the 25x'25 recommendations.

The program supports both large- and small-scale projects, and would generate jobs both in installation of renewable energy technologies and in manufacturing of the required component parts. An example of CREBs at work is at the University of Minnesota, Morris where the school is using the bonds to construct the second wind turbine on campus, add a steam turbine that will convert to electricity the "green" steam from a biomass facility that is under construction, and to purchase a third wind turbine that will be located in western Minnesota, to be shared with the Mille Lacs Band of Ojibwe. The on-campus wind turbine will bring the campus to nearly 100 percent power by wind. School officials say CREBs help in reducing the campus' carbon footprint by more than 80 percent. For more on the UM-M project, go to http://www.morris.umn.edu/ummnews/View.php?itemID=5178.

A key element among the 25x'25 economic recovery recommendations is the call for substantial extension and restructuring of both the renewable energy Production Tax Credit and Investment Tax Credit. Currently, a PTC or an ITC is given in the form of a non-transferrable tax credit to be claimed against income for developers of and investors in renewable energy for electricity

projects. Furthermore, any additional state or local government funding reduces the amount of the tax credit, since the project is considered subsidized.

25x'25 advocates say that while the credits can reduce a company's tax bills, many renewable energy companies are start-ups that are not yet profitable and don't pay enough taxes to benefit from a credit. With the downturn in the credit market, many institutions who previously bought the credits from renewable energy companies are no longer in the market, negating the effectiveness of the credits as incentives. The recommendations would make the tax credits directly refundable, so that if a renewable energy start-up can use its credits to lower its tax bill to less than zero, it would actually receive a check from the government for the difference. According to National Renewable Energy Laboratory, if the PTC were transferable to lending institutions, or if it were applicable as prepayment on any loans, the industry could fully utilize the PTC and the ITC.

The recommendations also call for extending the credits universally for at least five years, noting that an unstable PTC/ITC policy serves as a disincentive to investors, particularly in this time of economic distress. The solar industry, for example, estimates that if PTC had not been extended at the last minute in 2008, the solar photovoltaic sector alone would have lost $8.1 billion in investment and a net 39,800 jobs in 2009.

The importance of the tax credits to renewable energy production is obvious, say advocates. But equal import, they noted, can be attached from the perspective of the market that seeks to use the renewable energy being produced. The Green Power Market Development Group, a unique commercial and industrial partnership dedicated to building corporate markets for green power, underscore the significant growth in demand for the renewable energy being generated by the use of PTCs and ITCs. As a collaboration of large energy users, the Green Power group is working to transform energy markets to enable corporate buyers to diversify their energy portfolios with green power and reduce their impact on climate change. The group, which seeks to develop 1,000 megawatts of new, cost-competitive green power in the United States by next year, includes Alcoa Inc., Delphi Corporation, The Dow Chemical Company, DuPont, FedEx Kinko's, General Motors, IBM, Interface, Johnson & Johnson, NatureWorks LLC, Pitney Bowes, Staples, and Starbucks.

The group is pursuing electricity from renewable resources including wind, solar, geothermal, biomass, landfill gas, and certified low-impact hydro; heat from renewable resources including solar thermal systems and direct use of landfill gas; and clean energy technologies. The group sends a clear signal to the marketplace that demand for cost-effective renewable resources exists and, by extension, the implementation of strong PTC and ITC policies is a good business decision. For more on the Green Group, go to http://www.wri.org/project/green-power-markets.

The 25x'25 economic recovery recommendations also call for improving tax incentives for Community Wind, a type of wind development that focuses on investment from local communities, rather from an outside investor. The National Renewable Energy Laboratory estimates that smaller community wind projects contribute twice as many jobs and income to a local community than a larger wind plant financed by outsider investment, showing that an average community wind plant of 20 MW can provide up to 41 jobs and $4 million in local

income, as opposed to an outside-investment 40 MW plant's 18 jobs and $1.3 million in income for the community.

However, community wind investors' income off the plant is often passive and under current regulations passive income has to be quite large to fully use Production Tax Credits. 25x'25 calls for a change in regulations to allow for local wind investment projects to count against active income of the local investors, generating more interest in, and investment by communities in local clean electricity sources, such as the Minwind III-IX community wind project in Luverne, MN**.** The Minwind projects are a series of nine farmer-owned wind projects in southwestern Minnesota, all based around the idea that local ownership is central to maximizing local benefits, and the projects are intended to both generate new income for farmers and benefit the local community's economy. The first two projects, Minwind I and II, were completed in the fall of 2002 and consist of two NEG Micon 950 kW turbines, among the first farmer-owned turbines in the nation. Minwind III through IX came online in 2004, each of these consisting of a single, 1.65 MW NEG Micon turbine. The success of projects such as Minwind has generated interest throughout the country in community wind investment opportunities and a change in the application of PTCs, advocates say. (It should also be noted that the Minwind projects also used USDA Section 9006 – now REAP – funds to help with engineering, transmission, equipment, and construction costs.) For more on the Minwind project, go to http://www.windustry.org/minwind-iii-ix-luverne-mn-community-wind-project.

Finally, the 25x'25 recommendations call on the federal government to appropriate funds for the Smart Grid Investment Matching Grant Program created under the Energy Independence and Security Act of 2007. The program provides reimbursement for 20 percent of qualifying Smart Grid Investments. Advocates say that within two years, the stimulus effect of this provision will become apparent through significant new job creation in the renewable energy electricity sector as more electricity sources will be able to capitalize on a better grid system. An estimated 300GW of wind power are awaiting grid connection and in order for the wind industry to expand, sector officials say, 12,000 miles of new transmission lines are needed, as well as a smart grid management system.

With the DOE reporting that transmission is the number one barrier preventing rapid long-term expansion of wind energy use, 25x'25 says at least $1.3 billion is needed to provide a more efficient, reliable transmission grid, which will also reduce electricity costs to consumers in states with high peak rates. To underscore the need for the Smart Grid program, a recent study from the Energy Policy Initiatives Center at the University of San Diego School of Law, finds that implementing "smart" communication and control technologies on the electric grid in the San Diego Region is not only technically feasible, but would also be cost effective.

The report identifies key technologies needed to create an intelligent framework in the region and recommends a timeline for implementation, including several near-term research, development and demonstration projects. The report identifies numerous potential benefits of implementing a Smart Grid, including reduced service outages, congestion costs and peak demands, along with increased system asset utilization, improved security and tolerance to natural disasters. In addition, the study says, implementing the Smart Grid could increase integration of distributed energy resources (e.g., rooftop solar system), and reduce emissions. For more on the study, go to http://www.gridwise.org/pdf/061017_SDSmartGridStudyFINAL.pdf.

"These are not pie-in-the-sky recommendations. They are not academic exercises," said 25x'25 Policy Chairman Ruth. "These recommendations are underscored by projects and 'on-the-ground' experience from all renewable energy sectors and areas across the country. It's important that Congress and President Obama understand that that with some relatively small shifts in policy and a small influx of new money, huge returns to our economy, to our energy security and to our environment are within our grasp."

A copy of 25x'25's economic recovery recommendations can be viewed at www.25x25.org.

Energy Improvement and Extension Act of 2008: Summary of Provisions

The Emergency Economic Stabilization Act of 2008 (Public Law 110-343) [4], which was signed into law on October 3, 2008, incorporates EIEA2008 in Division B. Provisions in EIEA2008 that require funding appropriations to be implemented, whose impact is highly uncertain or that require further specification by Federal agencies or Congress, are not included in *AEO2009*. Moreover, *AEO2009* does not include any provision that addresses a level of detail beyond that modeled in NEMS. *AEO2009* addresses those provisions in EIEA2008 that establish specific tax credits and incentives, including the following:

- Extension of the residential and business tax credits for renewable energy as well as for the purchase and production of certain energy-efficient appliances, many of which were originally enacted in EPACT2005
- Removal of the cap on the tax credit for purchases of residential solar photovoltaic (PV) installations and an increase in the tax credit for residential ground-source heat pumps
- Addition of a business investment tax credit (ITC) for combined heat and power (CHP), small wind systems, and commercial ground-source heat pumps
- Provision of a tax credit for the purchase of new, qualified, plug-in electric drive motor vehicles
- Extension of the income and excise tax credits for biodiesel and renewable diesel to the end of 2009 and an increase in the amount of the tax credit for biodiesel and renewable diesel produced from recycled feedstock
- Provision of tax credits for the production of liquid petroleum gas (LPG), LNG, compressed natural gas (CNG), and aviation fuels from biomass
- Provision of an additional tax credit for the elimination of CO_2 that would otherwise be emitted into the atmosphere in enhanced oil recovery and non-enhanced oil recovery operations
- Extension and modification of key renewable energy tax provisions that were scheduled to expire at the end of 2008, including production tax credits (PTCs) for wind, geothermal, landfill gas, and certain biomass and hydroelectric facilities
- Expansion of the PTC-eligible technologies to include plants that use energy from offshore, tidal, or river currents (in-stream turbines), ocean waves, or ocean thermal gradients.

The following discussion provides a summary of the EIEA2008 provisions included in *AEO2009* and some of the provisions that could be included if more complete information were available about their funding and implementation. This discussion is not a complete summary of all the sections of EIEA2008.

End-Use Demand

Residential and Commercial Buildings

EIEA2008 reinstates and extends tax credits for renewable energy and for the purchase and production of certain energy-efficient appliances, many of which were originally enacted in EPACT2005. Some of the tax credits are extended to 2016. In addition, the $2,000 cap for residential PV purchases is removed, and the cap for ground-source heat pumps is raised from $300 to $2,000. The legislation also adds business ITCs for CHP, small wind systems, and commercial ground-source heat pumps.

Residential Tax Credits

EIEA2008 Titles I and III include various extensions, modifications, and additions to the tax code that have the potential to affect future energy demand in the residential sector. Sections 103 through 106 of Title I reinstate the tax credits that were implemented under EPACT2005 for efficient water heaters, boilers, furnaces, heat pumps, air conditioners, and building shell equipment, such as windows, doors, weather stripping, and insulation. The amount of the credit varies by appliance type and ranges from $150 to $300. The maximum credit for ground-source heat pumps, which was $300 under EPACT2005, is $2,000 under EIEA2008. For solar installations, which can receive a 30-percent tax credit under both

EPACT2005 and EIEA2008, the $2,000 cap has been removed. With the cost and unit size of residential PV assumed in *AEO2009*, the credit can now reach nearly $10,000 per unit. The tax credit for small wind generators is also extended through 2016 in EIEA2008; however, penetration of residential wind installations over the next decade is projected to be negligible.

Sections 302, 304, and 305 of EIEA2008 Title III also contain provisions that can directly or indirectly affect future residential energy demand. Section 302 adds a provision to allow a tax credit for the use of biomass fuel, which can include wood, wood pellets, and crops. In NEMS, the credit is represented as a reduction in the cost of wood stoves used as the primary space heating system. Section 304 extends the $2,000 tax credit for new homes that are 50 percent more efficient than specified in the International Energy Conservation Code through 2009. Section 305 extends the PTC for refrigerators, dishwashers, and clothes washing machines that are a certain percentage more efficient than the current Federal standard. The duration and value of the credit vary by appliance and the level of efficiency achieved. For *AE02009*, it is assumed that the full amount of the credit is realized by consumers in the form of reduced purchase costs.

Commercial Tax Credits

Sections 103, 104, and 105 of EIEA2008 Title I extend or expand tax credits to businesses for investment in energy efficiency and renewable energy properties. Section 103 extends the EPACT2005 business ITCs (30 percent for solar energy systems and fuel cells, 10 percent for microturbines) through 2016; expands the ITC to include a 10-percent credit for CHP systems through 2016; and increases the credit limit for fuel cells from $500 to $1,500 per half kilowatt of capacity. Section 104 provides a 30-percent business ITC through 2016 for wind turbines with an electrical capacity of 100 kilowatts or less, capped at $4,000. Section 105 adds a 10-percent business ITC for ground-source heat pumps through 2016. In the *AEO2009* reference case, relative to a case without the tax credits, these provisions result in a 3.2-percent increase in electrical capacity in the commercial sector by 2016.

Section 303 of EIEA2008 Title III extends the EPACT2005 tax deduction allowed for expenditures on energy-efficient commercial building property through 2013. This provision is not reflected in *AEO2009*, because NEMS does not include economic analysis at the building level.

Industrial Sector

Under EIEA2008 Title I, "Energy Production Incentives," Section 103 provides an ITC for qualifying CHP systems placed in service before January 1, 2017. Systems with up to 15 megawatts of electrical capacity qualify for an ITC up to 10 percent of the installed cost. For systems between 15 and 50 megawatts, the percentage tax credit declines linearly with the capacity, from 10 percent to 3 percent. To qualify, systems must exceed 60-percent fuel efficiency, with a minimum of 20 percent each for useful thermal and electrical energy produced. The provision was modeled in *AEO2009* by adjusting the assumed capital cost of industrial CHP systems to reflect the applicable credit.

Section 108 extends an existing PTC, originally created under the American Jobs Creation Act of 2004 for new "refined coal" facilities producing steam coal, to those that produce metallurgical coal for the steel industry. The credit applies to coal processed with liquefied coal waste sludge and "steel industry coal" (defined as coal used for feedstock in coke manufacture). The production credit for steel industry coal is $2 per barrel of oil equivalent actually produced (equivalent to 34 cents per million Btu or $8.55 per short ton) over the first 10 years of operation for plants placed in service in 2008 and 2009. Because the *AEO2009* NEMS does not include the level of detail addressed by this tax credit, its incremental effect is not reflected in *AEO2009*. To the extent that the credit is passed on from coal suppliers as a reduction in the price of metallurgical coal, the provision would tend to reduce steel production costs and provide an incentive for domestic manufacture of coke.

Transportation Sector

EIEA2008 Title II, Section 205, provides a tax credit for the purchase of new, qualified plug-in electric drive motor vehicles. According to the legislation, a qualified plug-in electric drive motor vehicle must draw propulsion from a traction battery with at least 4 kilowatthours of capacity, use an off-board source of energy to recharge the battery, and, depending on the gross vehicle weight rating (GVWR), meet the U.S. Environmental Protection Agency (EPA) Tier II vehicle emission standards or equivalent California low-emission vehicle emission standards.

The tax credit for the purchase of a PHEV is $2,500 plus $417 per kilowatthour of traction battery capacity in excess of the minimum required 4 kilowatthours, up to a total of $7,500 for a PHEV with a GVWR of 10,000 pounds or less. The limit is raised to $10,000 for any new eligible PHEV with a GVWR between 10,000 and 14,000 pounds, $12,500 for a PHEV between 14,000 and 26,000 pounds GVWR, and $15,000 for any eligible PHEV with a GVWR greater than 26,000 pounds.

The legislation also includes a phaseout period for the tax credit, beginning two calendar quarters after the first quarter in which the cumulative number of qualified plug-in electric vehicles sold in total by all manufacturers reaches 250,000. The credit will be reduced by 50 percent in the first two calendar quarters of the phaseout period and by another 25 percent in the third and fourth calendar quarters. Thereafter, the credit will be eliminated. Regardless of calendar quarter or whether 250,000 vehicles are sold, the credit will be phased out after December 31, 2014. The tax credits for PHEVs are included in *AEO2009*.

Liquids and Natural Gas

EIEA2008 includes tax provisions that address petroleum liquids and natural gas. In Title II, "Transportation and Domestic Fuel Security Provisions, Credits for Biodiesel and Renewable Diesel," Section 202 extends income and excise tax credits for biodiesel and renewable diesel to the end of 2009. The legislation also raises the credit from 50 cents per gallon to $1 per gallon for biodiesel and renewable diesel from recycled feedstock. It also removes the term "thermal depolymerization" from the definition of renewable diesel and replaces it with "or other equivalent standard," allowing biomass-to-liquids (BTL) producers to obtain the $1 per gallon income tax credit. The legislation further specifies that the term "renewable diesel" shall include fuel derived from biomass that meets Defense Department specifications for military jet fuel or American Society for Testing and Materials specifications for aviation turbine fuel. These provisions are included in *AEO2009*.

Section 204 extends the excise tax credit for alternative fuels under Section 6426 of the Internal Revenue Code through 2009. Beginning on October 1, 2009, qualified fuel derived from coal through gasification and liquefaction processes must be produced at a facility that separates and sequesters at least 50 percent of its CO_2 emissions, increasing to 75 percent beginning in 2010. Section 204 also provides credits applicable to biomass gas versions of LPG, LNG, CNG, and aviation fuels. This provision is also included in *AEO2009*.

Coal

EIEA2008 Title I, Subtitle B, "Carbon Mitigation and Coal Provisions," modifies the tax credits available to coal consumers who sequester CO_2. In Section 111, an additional $1.25 billion is allocated to advanced coal-fired plants that separate and sequester a minimum of 65 percent of the plant's CO_2 emissions, bringing the aggregate ITC available for advanced coal projects to $2.55 billion. For this additional ITC, the allowable credit is equivalent to 30 percent of the project's qualified investment cost. Qualified investments include any expenses for property that is part of the project. For example, expenses for equipment for coal handling and gas separation would be qualifying investments if they were required for the project.

Section 112 provides an additional $250 million in ITCs for carbon sequestration equipment at qualified gasification projects, including plants producing transportation-grade liquid fuels. Eligible feedstocks for

the projects include coal, petroleum residues, and biomass. To qualify for the ITC, a gasification facility must capture and sequester a minimum of 75 percent of its potential CO_2 emissions.

Section 115 of Subtitle B provides an additional tax credit for sequestration of CO_2 that would otherwise be emitted into the atmosphere from industrial sources. Tax credits of $10 per ton for CO_2 used in enhanced oil recovery and $20 per ton for other CO_2 sequestered are available. The Section 115 tax credit is limited to a total of 75 million metric tons of CO_2. In the *AEO2009* reference case, Sections 111, 112, and 115 are modeled together, resulting in 1 gigawatt of advanced coal-fired capacity with CCS by 2017.

Section 113 of Subtitle B extends the phaseout of payments by coal producers to the Black Lung Disability Trust Fund from 2013 to 2018. This provision also is modeled in the *AEO2009* reference case.

Other coal-related provisions of Subtitle B are not included in *AEO2009*, either because their effects on energy markets are minimal or nonexistent, or because they cannot be modeled directly in NEMS. They include: a provision that refunds payments to the Black Lung Disability Trust Fund for U.S. coal exports (Section 114); classification of income derived from industrial-source CO_2 by publicly traded partnerships as qualifying income (Section 116); a request for a National Academy of Sciences review of GHG provisions in the IRS Tax Code (Section 117); and a tax credit for alternative liquid fuels that is valid only through the end of 2009 (Section 204).

Renewable Energy

EIEA2008 also contains several provisions that extend and modify key tax provisions for renewable energy that were scheduled to expire at the end of 2008. Section 101 extends the PTC for wind, geothermal, landfill gas, and certain biomass and hydroelectric facilities. Wind facilities that enter service before January 1, 2010, are eligible for a tax credit of 2 cents per kilowatthour, adjusted for inflation, on all generation sold for the first 10 years of plant operation. Other eligible plants will receive the tax credit if they are on line by December 31, 2010 (but biomass plants that do not use “closed-loop” fuels [5] will receive a credit of 1 cent per kilowatthour).

Section 102 expands the suite of PTC-eligible technologies to include plants that use energy from offshore, tidal, or river currents (in-stream turbines), ocean waves, or ocean thermal gradients. Projects must have at least 150 kilowatts of capacity and must be on line by December 31, 2011. The PTC extension is included in *AEO2009* for all eligible technologies, with the exception of marine technologies, which are not represented in NEMS.

Section 103 extends the 30-percent ITC for business-owned solar facilities to plants entering service through December 31, 2016. The tax credit is valued at 30 percent of the initial investment cost for solar thermal and PV generating facilities that are owned by tax-paying businesses (residential owners can take advantage of tax credits discussed below; other forms of government assistance may be available to tax-exempt owners). Starting in 2017, eligible facilities will receive only a 10-percent ITC, which is not scheduled to expire. The extension through 2016 and the permanent 10-percent ITC are represented in *AEO2009*.

Section 107 authorizes continuation of the Clean and Renewable Energy Bonds (CREB) program at a level of $800 million. CREBs are issued by tax-exempt project owners (municipals and cooperatives) to raise capital for the construction of renewable energy plants. Interest on the bonds is paid by the Federal Government in the form of tax credits to the bond holders, thus providing the bond issuer with interest-free financing for qualified projects. Because NEMS assumes that all new renewable generation capacity will come from independent power producers, this provision, which targets public utilities, is not included in *AEO2009*.

4. For complete text of the Emergency Economic Stabilization Act of 2008, including Division B, "Energy Improvement and Extension Act of 2008," see web site http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?db name=110_cong_bills&docid=f:h1424enr.txt.pdf

5. "Closed-loop" refers to fuels that are grown specifically for energy production, excluding wastes and residues from other activities, such as farming, landscaping, forestry, and woodworking.

Websites with Legislation and Clean Energy-related Reports and Studies

American Recovery and Reinvestment Act 2009
http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h1enr.pdf

Track updates on energy investments from the American Recovery and Reinvestment Act at this website:
http://www.recovery.gov/transparency/agency/reporting/agency_reporting1.aspx?agency_code=89

American Clean Energy and Security Act of 2009

Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009 --
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Clean Air Act -- http://www.epa.gov/air/caa/
The Clean Air Act is the law that defines EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer.

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U.S. Department of Energy:
The Department of Energy maintains numerous websites for its multiple programs. Visit the main webpage at www.energy.gov

U.S.Climate Change Technology Program – Strategic Plan 2006
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