

FY 2009 Industry Assessment

ENERGY INDUSTRIES

A. Background on the Industry

The energy industry is defined, in general, as all the industries involved in the production and sale of energy, including fuel extraction, manufacturing, fuel and electricity transport, refining and distribution. In particular, the energy industry comprises:

- companies that explore for and produce oil and gas (upstream);
- companies that transport fuels and electricity (midstream);
- refineries (downstream);
- oil and gas field equipment manufacturers;
- coal companies;
- nuclear energy equipment and service suppliers;
- renewable energy equipment manufacturers (solar, wind, bio-mass, geothermal, hydro, ocean and tidal);
- companies working on alternative fuels and future energy technologies;
- energy efficiency technology purveyors;
- electric power generation, transmission and distribution equipment manufacturers; and,
- energy services companies;

The North American Industry Classification System (NAICS) codes for the energy industries are included in Attachment 1. Note that Energy and Oil and Gas Field Services are covered by the DAS for Services/MAS.

B. Industry Overview and Global Competitiveness

The United States is the world's largest energy consumer and is a leader in the production and supply of world energy. U.S. energy companies produce oil, natural gas, coal, nuclear, alternative and renewable energy as well as supply energy technology to almost every country in the world. U.S.-made energy equipment (except for renewable energy equipment) dominates the U.S. market and commands strong market share in most countries. The United States operates the most nuclear reactors in the world, has the largest installed nuclear power capacity, and generates the most nuclear power in the world.

Different types of companies predominate in different energy subsectors. Companies within the United States that are engaged in oil/gas exploration and production and electric power production are a mix of small, medium, and large companies; those that operate abroad tend to be large. As for the manufacturing of energy equipment, large companies dominate the manufacturing of oil and gas field equipment, while small and medium size companies predominate the manufacture of renewable energy equipment. The nuclear sector is a combination of large companies supported by small and medium sized companies. The top five U.S. coal companies have consistently accounted for approximately 53 percent of all U.S. coal production.

U.S. Energy Supply and Demand

Fossil Energy and Related Equipment (Oil, Gas, Coal and Field Machinery)

Although U.S. companies are leaders in the world **oil industry**, U.S. domestic oil production has been declining or flat for many years, after peaking in the 1970s. Even so, the United States remains the third largest oil producer in the world behind Saudi Arabia and Russia (see Table 1). In 2008, average U.S. crude oil production was 4.9 million barrels per day (bpd). Imports of crude oil and oil products averaged 13.01 million bpd, most coming from the Western Hemisphere (see Table 2). The Energy Information Administration (EIA) expects 2009 U.S. crude oil production to increase to 5.25 million bpd, as some new fields in the Gulf of Mexico begin production. The downward trend from \$140 plus per barrel prices of oil in July 2008 leads EIA to estimate crude oil prices in the \$43 per barrel range for 2009.

Table 1. Top Oil and Gas Producers, 2007

Country	Oil production (million bpd)*	Country	Gas production (billion cubic meters)
Saudi Arabia	10.4	Russia	607.4
Russia	9.9	USA	545.9
USA	6.8	Canada	183.7
Iran	4.4	Iran	111.9
China	3.7	Norway	89.7
Mexico	3.4	Algeria	83
Canada	3.3	Saudi Arabia	75.9
UAE	2.9	UK	72.4

*Includes Crude oil, shale oil, oil sands, natural gas liquids

Source: BP Statistical Review of World Energy 2008

**Table 2. Top Oil Suppliers to the U.S., October 2008
(million bpd)**

Canada	2.58
Saudi Arabia	1.48
Mexico	1.43
Venezuela	1.16
Nigeria	979

Source: Energy Information Administration

As for **natural gas**, a worldwide market has yet to materialize. U.S. domestic natural gas production is estimated to have increased 5.9 percent in 2008 due to the development of unconventional reserves (primarily shale gas). U.S. natural gas consumption was 22.9 trillion cubic feet in 2007. From January – October 2007, consumption was 19.16 trillion cubic feet, and for the same period in 2008 dropped to 18.89 trillion cubic feet. A mild winter in 2008 and the global economic downturn were primary factors for this decrease.

2007 natural gas imports totaled 4.6 trillion cubic feet, or 20 percent of total U.S. natural gas consumption. 3.8 trillion cubic feet of these imports, or 80 percent, entered the United States via pipeline, primarily from Canada. 770 billion cubic feet entered as liquefied natural gas (LNG),

primarily from Trinidad & Tobago, Egypt, Nigeria, Algeria, Equatorial Guinea, and Qatar. U.S. LNG imports dropped more than 50 percent from 2007 to 2008 due to an increase in overall U.S. natural gas production led by shale gas, a mild U.S. winter, and cargo diversions to countries willing to pay more for LNG than the United States.

The **U.S. oil and gas equipment manufacturing and services** industry's performance was relatively strong for the whole of 2008, despite the economic downturn towards the end of the year. Exports of U.S. oil and gas field machinery are projected to have reached about \$12.5 billion, based on data available for the period between January and November. This represents an 8.5 percent increase from 2007, which in turn, recorded exports roughly 20 percent greater than in 2006. In 2008, imports of oil and gas equipment reached an estimated \$2.1 billion, or comparable to imports during 2007. Imports totaled \$1.7 billion in 2006.

With respect to **coal**, the United States has approximately 240 years of domestic coal reserves at current production rates. In 2008, the U.S. coal industry experienced a record year, as production increased by 1.7 percent from 2007. Wyoming, West Virginia, Kentucky, Pennsylvania, and Montana were the top five coal producing states. In 2008, U.S. coal exports totaled approximately 59 million short tons, an increase of approximately 19 percent from 2007. Over 97 percent of U.S. coal production continues to go toward electricity generation. In 2008, coal-based power generation increased 1.5 percent to 2,021 billion kilowatt hours, with coal continuing to provide nearly 50 of total U.S. electricity generation. Domestic and international coal-fired power generation facilities have widely applied clean coal technologies (CCT).

U.S. oil and gas companies face serious challenges internationally, as more and more oil and natural gas resources in other countries have been made unavailable to foreign investors. According to a recent study by the Baker Institute, currently about 77 percent of proven global oil reserves are controlled by national oil companies that do not allow foreign equity participation in their development projects. In addition, a significant proportion of the world's gas reserves are controlled by national oil companies.¹ Most of the major oil producing countries own state-controlled oil companies. U.S. companies have responded by investing in unconventional oil resources, such as the Canadian oil sands, and have flocked to countries like Libya and Turkmenistan, which have opened their doors in recent years.

The U.S. oil and gas field equipment and services suppliers face strong competition from manufacturers in Western Europe, Canada, Japan, Korea, Russia, China, Brazil, Argentina and Australia. European oil and gas field machinery manufacturers have favorable market shares in their regions for manufactured offshore platforms, hydraulics, moorings, and subsea components. European manufacturers have an advantage in the North Sea market, while the United States leads in the Western Hemisphere.

Nuclear Energy

The United States generates about 20 percent of its electricity from **nuclear energy** from 104 nuclear power plants in 31 states. Currently, 51 commercial reactors in the United States have received 20-year license extensions from the Nuclear Regulatory Commission (NRC), giving

¹ See Attachment 2: Table 'Top 50 Oil and Gas Companies'. Out of the top 50 oil and gas companies, 31 companies are either wholly or partially state-owned.

them up to a total of 60 years of operation. There is growing public and political support for nuclear energy as a base-load source of domestic, emission-free energy and as a means to reduce foreign dependence on fossil fuel. In order to maintain the United States' current 20 percent nuclear share of overall U.S. electricity generation, 34,000 megawatt electrical (Mwe) of new nuclear generation would be required by 2030, which equates to roughly 25 new reactors. The United States has not commissioned a new nuclear power plant in 30 years. This situation now appears to be changing with 17 companies and consortia submitting construction and operating license applications (COLAs) to the NRC to build 26 new nuclear reactors in the United States. The first new plants are expected to come on line in 2015. The new plants will have capacities ranging from 1,175 Mwe for the Westinghouse' AP1000 to 1,500 Mwe for GE's economic simplified boiling water reactor (ESBWR) and to 1,600 Mwe for the Areva's evolutionary power reactor (EPR).

While much of the domestic nuclear infrastructure has atrophied over 30 years of inactivity, U.S. nuclear reactor vendors and associated companies have: participated in the international market for commercial nuclear power (often as minority partner); invested in research and development for the next generation of nuclear reactors; and, upgraded the domestic fleet's efficiency significantly, with increased output equivalent to 27 new 1,000 Mwe power plants.

Renewable Energy and Energy Efficiency (Solar, Wind, Bio-Mass, Geothermal, Hydro, Ocean Tidal, Biofuels, and Energy Efficient Technologies)

The financial slowdown has been more severe for the **renewable energy** market compared to the general economy as investors flee high-risk, high-return energy projects. This has led to job cuts in U.S. manufacturing plants of solar and wind components, and a reduction of projects.

The U.S. renewable energy industry continues to operate at a disadvantage to competitors in the European Union, which generally have stronger incentives for renewable energy technologies. In the medium-term, U.S. companies are expected to catch up to foreign competitors as the United States becomes the largest market for renewable energy. 2008 marked the first time that U.S. surpassed Germany as the global leader in wind installations. The United States is the largest producer of geothermal energy in the world and stationary biomass power capacity also had a banner year, contributing nearly 12 GW of capacity to the U.S. market.

Biofuels continue to play an important role in the U.S. energy mix. In 2007, ethanol fuel production in the United States was approximately 6.5 billion gallons, up from 4.9 billion gallons in 2006. 2008 production numbers are only available through October, but annual production was down by 440 million gallons compared with October 2007. The U.S. remains the largest global ethanol fuel producer, followed by Brazil, the European Union, China, and Canada. Production could reach 11 billion gallons per year by 2009. Biodiesel production is smaller, but growing quickly. In fiscal year 2007 (October 2006-September 2007), U.S. companies produced 450 million gallons of biodiesel, up from 250 million in fiscal year 2006, and just 2 million gallons in fiscal year 2000.

Ethanol imports have substantially increased in recent years, but declined sharply from 2006 to 2007, from 653 million gallons to 426 million gallons. The primary ethanol exporter to the United States is Brazil, exporting over 400 million gallons to the United States in 2006. In 2007,

global biofuels production reached approximately 16 billion gallons, or 4 percent of the global transportation fuel supply. Ninety percent of this production occurred in the United States, Brazil, and the European Union. Production in the United States and Brazil is primarily ethanol, while biodiesel is the main biofuel in Europe.

Table 1: Top U.S. Ethanol Producers, by Capacity 2008

Company	Current Capacity (mgy)
Poet Energy	1469
Archer Daniels Midland (Total)	1070
VeraSun Energy Corporation (Total)	450
Hawkeye Renewables	445
White Energy	248

mgy=millions of gallons/year

Source: Renewable Fuels Association

Table 2: Top U.S. Biodiesel Producers, by Capacity 2007

Company	Current Capacity (mgy)
GreenHunter BioFuels, Inc.	105
Imperium Grays Harbor	100
Green Earth Fuels of Houston, LLC	90,
ADM	85,
Louis Dreyfus Agricultural Industries, LLC	80
Delta Biofuels, Inc.	80,

mgy=millions of gallons/year

Source: National Biodiesel Board

Table 3 – Top Fuel Ethanol-Producing Countries (Millions of Gallons)

Country	2007
USA	6498.6
Brazil	5019.2
European Union	570.3
China	486.0
Canada	211.3

Source: Renewable Fuels Association

The rapid expansion of the biofuels industry in the past several years has been driven by: (1) the federal Renewable Fuel Standard (RFS) that mandates the blending of an increasing amount of renewable fuels, including ethanol and biodiesel, into the gasoline supply (from 9 billion gallons in 2008 to 36 billion gallons by 2022); (2) state mandates for the replacement of methyl tertiary-butyl ether (MTBE) as a fuel oxygenate; and, (3) federal tax incentives for biofuels production.

While difficult to quantify, the market for **energy efficiency** is large and growing. According to the American Council for Energy-Efficient Economy (ACEEE), \$300 billion was invested in

energy efficiency in 2004 – a number that could grow to \$700 billion by 2030. Conceptually, it can be difficult to distinguish between firms that provide goods and services designed to improve customers' energy efficiency, and firms that are seeking to produce goods and services more efficiently. An example of the former would be an energy services company (ESCO), which develops, installs, and arranges financing for projects to improve the energy efficiency and maintenance costs for facilities, and is paid back from energy cost savings over time. A factory that installs more efficient motors, drivers, and lighting into its production process is an example of the latter.

Almost 60 percent of total energy efficiency investments in 2004 were made in the buildings sector, including appliances, electronics, and commercial and residential structures. ACEEE research suggests roughly \$43 billion of this investment represents the “premium” paid by firms for goods and services that are more energy-efficient than their closest substitute.

Efficiency improvements in the energy-intensive industrial sector, however, have lagged far behind. According to the ACEEE, the industrial sector received about 25 percent of total energy efficiency investment, despite consuming 37 percent of the nation's energy. Analysts expect fierce global competition, rising cost of electricity, and growing importance of carbon emissions, will force U.S. industry to consider energy efficiency as a way to increase competitiveness and maintain profits.

Power Transmission and Distribution and Smart Grid

The term **smart grid** refers to a digital upgrade of distribution and transmission grids to both optimize current operations, as well as open up new markets for alternative energy production. In the United States, approximately 7 percent of electricity is lost through the transmission and distribution of power to the end user. The use of two-way communications, advanced sensors, and distributed computing technology will improve the efficiency, reliability, and safety of power delivery and use. DOE has calculated that the modernization of U.S. grids with the addition of smart grid capabilities will save between \$46 and \$117 billion over the next 20 years. Smart grid features could expand energy efficiency beyond the grid and into the industrial sector and homes. Smart grid systems also can track the production of power from large numbers of small power producers such as owners of rooftop solar panels, an arrangement that would otherwise prove problematic for power operators at local utilities.

Although there are specific and proven smart grid technologies in use, smart grid is an aggregate term for a set of related technologies rather than a name for a specific technology with a generally agreed on specification. Some of the benefits of a modernized electricity network include: reducing power consumption by consumers during peak hours (referred to as ‘demand side management’); enabling grid connection of distributed generation power (notably photovoltaic arrays, small wind turbines, small hydro, or combined heat power generators in buildings); incorporating grid energy storage for distributed generation load balancing; and, eliminating or containing failures such as widespread power grid outages. The increased advancement of smart grid technology is expected to save consumers money and help reduce CO2 emissions.

C. Domestic Environment

Regulations

Fossil Energy and Related Equipment

Oil and gas companies must comply with numerous regulations that can delay operations and increase costs. The principal regulations that affect the oil and natural gas industry include environmental regulations under the Clean Water and Clean Air Acts, Forest Service restrictions, the Endangered Species Act, and the Coastal Zone Management Act.

Regulations that increase operation costs are of particular concern to producers with marginal oil and natural gas wells. There are over 400,000 marginal oil wells and 250,000 marginal natural gas wells (defined as producing less than 15 bpd of oil or 75 thousand cubic feet of gas per day) in the United States. According to the National Petroleum Council, marginal oil and gas wells account for about 17 percent of domestic oil production and 9 percent of domestic gas production. Since average production from a marginal oil well is only 2.2 bpd, any increase in regulatory compliance costs can force the operator to cease production.

U.S. oil and gas equipment manufacturers exist in the same regulatory environment established for other U.S. manufacturers. They also must provide equipment and services that are in compliance with laws affecting drilling, production and disposal operations by upstream oil and gas companies. The Clean Air Act, Clean Water Act, various environmental regulations enforced by EPA and state agencies, the Family and Medical Leave Act, Sarbanes-Oxley Act, and workplace safety regulations enforced by OSHA and state agencies all impact in various ways on oil and gas equipment manufacturers. Further, many U.S. oil- and gas-producing states have their own extensive environmental regulations for pollution emission and for waste disposal.

With respect to the **coal industry**, one particular regulation which has imposed significant costs is the Mine Improvement and New Emergency Response Act (MINER) of 2006. The MINER Act of 2006 contains a number of provisions to improve safety and health in America's mines. The Congressional Budget Office has estimated the cost to the private sector, as stipulated by the MINER Act, to exceed \$128 million per year. As underground mine production totals approximately 367,557 thousand short tons (351,790 thousand short tons, as of 2007), coal companies with underground mining operations will pay \$383.87 per ton to comply with the MINER Act regulations.

In addition, the lack of federally-mandated regulations to reduce CO₂ and greenhouse gas (GHG) emissions (both of which fall outside of the Clean Air Interstate Rule and the Clean Air Mercury Rule of 2005) has left coal companies and power producers without a clear indication of how or when future emissions regulations may be put forward. Consequently, the construction of a number of proposed coal-fired power plants has been put on hold. The coal industry has indicated that the enactment of federally-mandated CO₂ and GHG regulations will serve as a clear and concrete mechanism to advance CO₂ and GHG emissions reduction technologies, notably carbon capture and storage (CCS) technology.

Nuclear

The U.S. **nuclear industry** is the most regulated industry within the energy sector. Previously, the NRC's licensing process was unpredictable and inefficient with sequential process reviews overlapping and leading to the NRC often demanding last minute design changes due to safety issues or some other issues that were typically not identified until after substantial investment was already made and the plant was almost completed. The NRC's regulatory regime now has implemented a new licensing process that eliminates this uncertainty. Under the new regime, the site and design of the plant are completed before the issuance of the combined COLA. The NRC and industry are optimistic about the new process. However, the regulations for handling spent fuel from nuclear power plants remains a challenge primarily because a national repository for nuclear waste has not been established despite the USG's responsibility to do so and despite the fact that industry has already provided the funds for its establishment.

Further, the Energy Policy Act of 2005 has provided strong new incentives for the expansion of nuclear power, which directly affects the industry's competitiveness. The legislation promotes nuclear power through the following:

- provides incentives to encourage construction of new nuclear plants, including production tax credits, loan guarantees, and risk protection/standby support for companies pursuing the first new reactors (\$500 million for the first two plants; \$250 million for next four plants);
- reauthorizes, for 20 years, the Price-Anderson Act, an insurance framework for protecting the public in the case of a nuclear incident; and
- funds nuclear energy R&D.

Renewable Energy and Energy Efficiency

Renewable Portfolio Standards (RPS), which mandate percentages of power generation from renewable sources, are key drivers of the **renewable energy industry** in states where they exist. As of February 2009, 28 states have a renewable portfolio standard, the structure of which can favor specific technologies or be "technology neutral." Without specific technology mandates, or "cutouts", a general RPS tends to favor more mature renewable energy technologies such as wind and solar over other emerging forms of renewable energy like enhanced geothermal or tidal power.

State regulations can be burdensome in the renewable energy industry. One example involves varying state interconnection standards. Renewable energy and distributed generation manufacturers must tailor the same product to meet standards for each state with different regulations. A national interconnection standard is needed, such as exists in the telephone industry.

With respect to **biofuels**, state and federal regulations, particularly blending requirements, have significantly expanded demand. The Energy Independence and Security Act of 2007 requires fuel blenders to use at least 36 billion gallons of renewable fuels by 2022. Additionally, the law mandates fuel producers and blenders to increase the use of cellulosic ethanol and other second generation biofuels, ensuring a market for those products still in development. Industry would like fuel regulations to allow higher limits on ethanol blends in gasoline to 10 percent by volume (E10). As U.S. ethanol production exceeds the maximum amount of ethanol that can be blended

into the fuel supply, industry is seeking new regulations which allow for blends of E12-E13 in the short-term, and E15-E20 in the medium term. Industry argues that modern cars can use such blends without requiring engine medication.

For industrial energy users, two federal regulatory obstacles for energy efficiency technologies include the EPA's permitting process for fuel-switching, which may discourage companies from installing more efficient boilers that use different fuels, and the New Source Review (NSR) process, mandated by the Clean Air Act, which requires stationary sources of air pollution to get permits before they start construction on a major modification or installation of new equipment. Often these processes are complex and time-consuming, making efficiency upgrades costlier and less likely.

On the other hand, if comprehensive climate change legislation is enacted, either in the form of an emissions cap-and-trade system or a carbon tax, industry will face strong cost pressures to pursue energy efficiency.²

For utilities, many state utility commissions regulate rates in such a way that utility revenues are directly related to the amount of electricity sold; thus, investments in energy efficiency by a utility can reduce revenue. Changes in the way utility revenues are determined ("de-coupling" revenue and amount of electricity sold) could remove this disincentive.

Power Transmission and Distribution and Smart Grid

The **power transmission and distribution industry** has been directly involved in the development of recent national energy legislation by contributing to President Clinton's U.S. Climate Change Action Plan and President Bush's National Energy Policy. The industry helps to develop and support energy-efficiency programs sponsored by DOE and EPA. The power transmission and distribution industry has recently supported passage and enactment of comprehensive energy legislation in Congress, related to the following provisions:

- energy efficiency standards: new federally mandated standards for smart grid technologies, electric motors, and appliance equipment.
- federal procurement: support for federal procurement of Energy Star products.
- energy tax incentives: tax deductions for commercial buildings that exceed American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) 90.1-2001 requirements, accelerated asset depreciation for electric distribution equipment and smart meters, and purchaser tax credits for specific equipment.
- transmission and distribution: deployment and incentives for **smart grid technologies**.
- energy research and development: support for new technologies and high performance buildings.

Non-Regulatory Issues

Fossil Energy and Related Equipment

² Cap and trade system, also referred to as emissions trading, is an administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants. A carbon tax is an environmental tax on emissions of carbon dioxide and other greenhouse gases. It is an example of a pollution tax.

The most significant ongoing, domestic non-regulatory issue for the **oil and natural gas industries** is access to resources. In October 2008, the Congressional moratorium on oil and natural gas exploration and production in certain Outer Continental Shelf (OCS) areas expired. According to the Minerals Management Service, the OCS areas affected hold undiscovered, technically available resources of up to 18.9 billion barrels of oil and 85.79 trillion cubic feet of gas. Additionally, according to the National Petroleum Council, restrictions on the development of many onshore federal lands means that undiscovered, technically available resources of up to 20 billion barrels of oil and 161 trillion cubic feet of gas are off limits to oil and gas companies. By comparison, the United States currently has oil and gas reserves estimated at 21 billion barrels and 238 trillion cubic feet, respectively, according to the U.S. Energy Information Administration.

Continual development of state-of-the-art technology allows the U.S. oil and natural gas industry to produce more oil and natural gas from more remote places - some previously unreachable - with significantly less adverse effect on the environment. With advanced technologies, the oil and gas industry can pinpoint resources accurately, extract them efficiently and with less surface disturbance, minimize associated wastes, and, ultimately, restore sites to original or better condition. Emphasis on technology advancement also applies to the **coal industry**. The industry is currently working with DOE and Congress to ensure funding for the FutureGen project, which seeks to combine carbon capture and storage and hydrogen production to create the world's cleanest coal-based power plant.

A major issue for U.S. oil and gas producers is a looming deficit of petroleum engineers and geologists. According to a 2006 Schlumberger study, in the United States, a large proportion of these professionals will reach retirement age in the next ten years, and there are not enough "mid-career" professionals (ages 30-45) to replace them. This problem could be resolved if companies are able to recruit professionals from Asia or Latin America, where there is projected to be a surplus of such talent over the next decade.

With respect to the U.S. **oil and gas equipment manufacturers**, a number of non-regulatory issues potentially impede their competitiveness. The continued volatility of both world oil prices and the industry's cost structures – particularly for steel and other metals that are used for fabricating end-products – continues to make financial planning difficult. Transportation constraints, both within the United States and to overseas markets, also exist because of inadequate infrastructure. Other challenges as noted above include access to technology and skilled labor.

Nuclear Energy

The U.S. nuclear power industry faces major challenges to restore its place as the leader in the nuclear power field. Namely, it needs to demonstrate it can successfully and profitably build new plants domestically. Serious competitiveness issues affecting domestic firms include a weak domestic nuclear infrastructure due to no new builds in decades. Specifically, there is a lack of nuclear engineers and high-skilled manufacturers, including steel welders and forgers. Storing and disposal of spent fuel remains a fundamental issue for the viability and growth of the industry as well. Financing plants is an obstacle due to a lack of investor confidence given the poor record of the last plants built, i.e., delays in the licensing and regulatory process.

Additionally, U.S. firms face formidable competition abroad because most of the foreign competition has more capital and political support from their governments compared to U.S. companies. Ensuring adequate liability insurance, i.e., the entry into force of the United Nations Convention on Supplementary Compensation (CSC), is necessary for U.S. companies to develop nuclear power sectors abroad. The USG does not provide liability insurance in the case of a nuclear accident to U.S. firms for their business abroad. Most of the competition has some sort of liability insurance from their government, which thereby disadvantages U.S. firms. CSC would provide international coverage and level the playing field.

Renewable Energy and Energy Efficiency

In renewable energy, a number of incentives are helping to fuel growth in the industry and keep **U.S. renewable energy manufacturers** competitive. These incentives include: federal production tax credits for wind and biomass; investment tax credits for solar and geothermal energy; federal procurement policies for purchasing 'green' equipment or 'green' power, and state tax and system benefit trust funds. These are strong incentives with wide appeal in the industry.

Short of a national renewable portfolio standard, a national price on carbon, and a mid-term extension of renewable tax incentives, moves by individual states to create portfolio requirements for procurement and for power generation are the greatest boosts both over the short term and the long term.

The lack of financing, especially in light of the credit crunch, is another non-regulatory constraint facing the industry. The cost of inputs also affects individual technologies. **Wind and hydropower technologies** are likely to become more competitive as steel prices have dropped.

U.S. **biofuels** producers say without the 51 cents per gallon federal tax credit for ethanol, the \$1 per gallon credit for agri-biodiesel and the 54 cents per gallon tariff on imported fuel ethanol, all in effect through 2010, foreign competition, from Brazil in particular, could significantly impact domestic production. Industry argues that the U.S. market is currently oversupplied, so cheaper foreign imports would drive out U.S. producers and would negatively impact the work being done by U.S. firms on next generation biofuels.

Several government policies are designed to encourage the growth of the energy efficiency industry. The Energy Policy Act 2005 extended DOE's Federal Energy Management Program's authority to implement Energy Savings Performance Contracting (ESPCs) to 2016. In addition, state policy is also an important driver of energy efficiency incentives for industrial, commercial, and residential sectors. Examples of successful efficiency programs include: air quality standards and enforcement; alternative fuels for vehicles and power generation; and, green building codes.

Federal agencies, state governments, gas and electric utilities, energy consumers, energy service providers, and environmental/energy efficiency organizations also are collaborating in a public-private partnership called the National Action Plan on Energy Efficiency (NAPEE), which is

working to identify barriers and best practices to facilitate the deployment of energy efficiency technologies.

D. Trading Environment

Fossil Energy and Related Equipment

As the United States is a net importer of both **oil and gas**, the industry does not face any export-related issues. However, because conventional oil and gas resources in the United States have been declining for many years (and other resources are off-limits, as referenced earlier), U.S. large and medium-sized oil and gas companies invest heavily in other resource-rich countries in order to stay in the upstream oil and gas business. Access to resources in other countries is therefore a key issue for them.

U.S. oil and gas equipment has a strong market position in every oil and gas-producing country in the world where U.S. companies are allowed to operate. In most of these countries, U.S. equipment is at least a third of the market and sometimes over 50 percent. The only major oil-producing country where the United States does not have a significant market share of the oil and gas equipment industry is Iran, which is the fourth largest oil producer.

In the first 11 months of 2008, the top five leading export markets for U.S. oil and gas equipment manufacturers were Singapore, the United Arab Emirates, China, Brazil, and the United Kingdom. During this period, these countries accounted for about 5.5 percent of the total export market for U.S. oil and gas equipment manufacturers.

Although U.S. oil and gas equipment is in wide demand and competitive in every market, there are still a number of non-tariff barriers with which exporting companies must contend. These include domestic content requirements, standards and certifications, and non-transparent procurement and other practices.

As the second largest **coal**-producing and coal-consuming country in the world (with China as the world's top coal producer and consumer), the United States is recognized internationally for its clean coal technology and emissions abatement equipment and market leadership. Specifically, U.S. clean coal technology companies are internationally recognized for their crushers, screeners, cleaners, boilers, generators, turbines, emissions abatement equipment, and air pollution control equipment. Such technologies can remedy environmental degradation in countries where coal is used as a primary energy source, most notably China, India, Australia, Russia, and Poland.

In 2007, China witnessed two significant coal-related events: for the first time ever, China commenced to import coal, as domestic supply did not meet domestic demand. Moreover, China emerged as the world's top greenhouse-gas emitting country, surpassing the United States by mid-2007. Both U.S. clean coal technology companies as well as competing international clean coal technology companies have voiced concern over IPR and technology transfer issues in China. Though China currently provides the greatest opportunity for U.S. and international clean

coal technology firms, many companies are concerned that their technological knowledge and patents will be relinquished should they commence operations in China.

Nuclear Energy

Currently, there are approximately 35 **nuclear** plants currently under construction worldwide in 12 countries, the bulk of them being in China, South Korea, Japan, and Russia. The International Atomic Energy Agency (IAEA) expects 70 new plants in the next 15 years. The global nuclear industry is developing at a definitively strong pace. The best prospect markets include: China, India, Russia, Europe (Finland, France, Baltics, UK), United States, Japan, and South Korea.

The major obstacles to international trade include mitigating nuclear liability risk, managing the onerous legal and regulatory requirements, meeting the local content requirements and price demands from foreign customers, and competing with state-owned companies abroad.

Renewable Energy and Energy Efficiency

The majority of U.S. **renewable energy** companies are non-export focused – a consequence of the size of the U.S. market. U.S. exporters face strong competition from Europe, Japan, China, and India.

Numerous nontariff barriers to trade exist within European and Asian markets that effectively restrict U.S. exports and prevent meaningful U.S. industry market penetration. China, for instance, maintains an 80 percent local content requirement for wind power and energy efficient technologies. Intellectual property concerns also remain.

Biofuels are not currently traded on fully open international markets. To encourage domestic growth, many governments provide incentives for domestic production while imposing duties on imports. As such, U.S. biofuels producers have minimal exports, finding domestic production more profitable. The future competitiveness of U.S. biofuels in the domestic and global fuels market depends on a number of factors, most importantly the market price of oil. Additional factors include: availability of low-cost feedstocks; continued U.S. government support for biofuels; expansion of fueling infrastructure and flexible fuel vehicles; technology breakthroughs in second-generation biofuels; and, the competitive strength of unconventional fossil fuels (e.g., oil sands, coal-to-liquids).

The United States is engaged in significant bilateral and multilateral cooperation on biofuels. The International Biofuels Forum (IBF), which includes Brazil, the United States, the European Commission, China, India, and South Africa, is working to achieve greater compatibility of biofuels standards and codes, key to expanding the global biofuels marketplace. The United States also signed Memorandums of Understanding (MOUs) on biofuels cooperation with the European Union, Brazil, and China, and is working to provide technical assistance to St. Kitts and Nevis, Haiti, El Salvador and the Dominican Republic on biofuels production.

According to the EIA, the world's consumption of energy is projected to increase 50 percent from 2005 to 2030. Coupled with the reality of climate change, this increase will no doubt fuel the market for **energy efficient services and technologies**. Two subsectors are highlighted below as examples of the challenges and opportunities abroad.

Energy Service Companies (ESCOs)

While exports of energy services have been minimal, the potential for U.S. ESCOs in markets with rising energy demand and electricity reliability issues could be substantial. China and India, for instance, have been identified as prime candidates for the deployment of ESCOs. Financing, conceptual unfamiliarity, intellectual property concerns and other barriers, however, discourage ESCOs from widely entering these markets.

District Energy

District energy involves connecting multiple heating and cooling energy users through a piping network to centralized energy sources, such as combined heat and power (CHP), or renewable energy sources like biomass or geothermal. The primary export potential for district energy is in China, the Middle East, and India. According to the International District Energy Association, total capital investment in China in district heating and cooling over the next 10 years is estimated at over \$360 billion. U.S. industry estimates U.S. companies could capture at least \$8.2 billion in sales. District cooling opportunities in the Middle East, primarily the United Arab Emirates, Saudi Arabia, Qatar, Bahrain, and Egypt over the next 10 years are estimated at \$7 billion, with a 20-year potential of almost \$15 billion. Annual U.S. district cooling sales are projected to grow from \$42 million in 2005 to nearly \$200 million by 2015.

Obstacles to U.S. companies in these foreign markets include lack of protection for intellectual property, particularly in India and China, and demands for unconditional guarantees on letters of credit – and, in some cases, no cap on economic losses in contract guarantees. Additionally, for many smaller district energy equipment and service providers, unfamiliarity with foreign markets and exporting in general prevent these companies from taking advantage of opportunities abroad.

Power Transmission and Distribution and Smart Grid

Currently, the U.S. transmission system is an interconnected network with more than 150,000 miles of high-voltage transmission lines. The goal of the Obama Administration is to determine how to use a combination of existing and emerging technology as well as policy to shore up the weak sections of the network. The Administration is aiming to expand R&D, pilot projects, and federal matching grants for the **Smart Grid** Investment Program to modernize the electricity grid, making it more efficient, secure, and reliable. Many of the smart grid technologies already have been developed, though standardization of these technologies is of key importance. The standardization of these technologies will further advance U.S. international industrial competitiveness, both in the field of smart grid technologies and among power-intensive manufacturing companies.

ATTACHMENT 1

ENERGY INDUSTRY NAICS CODE

<u>Product/Service Name</u>	<u>NAICS Codes</u>
Petroleum and Natural Gas Extraction	211111
Natural Gas Liquid Extraction (pt)	211112
Bituminous Coal & Lignite Surface Mining	212111
Bituminous Coal Underground Mining	212112
Anthracite Mining	212113
Support Activities for Coal Mining	213113
Drilling Oil and Gas Wells	213111
Oil and Gas Distribution Systems	221210
Manufacturing Industrial Organic & Inorganic Gases	225120
Other Renewable Power Drilling, Tapping, & Capping	235810
Hydroelectric Plant Development & Construction	234990
Refining Petroleum (fractionation, distillation or cracking)	324110
Petroleum Lubricating Oil and Grease Manufacturing	324191
All Other Petroleum and Coal Product Manufacturing (pt)	324199
Mining and Oil & Gas Field Machinery Manufacturing	333131
Oil & Gas Field Machinery and Equipment Manufacturing	333132
Solar Power Chip Manufacturing	334413
Solar Power Heating Equipment	334140
Solar Power Wholesaling Plumbing Equipment	421720
Solar Power Wholesaling Roofing	421330
Solar Power Wholesaling Electronic Parts & Equip.	421690
Nuclear fuels, inorganic, manufacturing	325188
Nuclear Reactor Containment Structure	234930
Nuclear Reactor Steam Supply System Manufacturing	332410
Nuclear Reactor Manufacturing	332410
Nuclear Instrument Modules Manufacturing	334519
Combustion Engineering Contractors	541330
Geophysical Surveying & Mapping Services	541360
Combustors, Non-hazardous Solid Waste	562213
Fuel Cells (technology requires revised NAIC code)	
Distribution of electric power	221122
Electric light and power plant (except hydroelectric) construction	237130
Electric power control	221121
Electric power control panel and outlet installation	238210
Electric power distribution systems	221122
Electric power generation, (except fossil fuel, hydroelectric, nuclear)	221119
Electric power generation, fossil fuel (e.g., coal, oil, gas)	221112
Electric power generation, hydroelectric	221111
Electric power generation, nuclear	221113
Electric power generation (solar, tidal, wind)	221119

Electric power transmission line and tower construction	237130
Electric power transmission systems	221121
Electrical power measuring equipment manufacturing	334515
Panelboards, electric power distribution, merchant wholesalers	423610
Power generation, electric (except fossil fuel, hydroelectric, nonhazardous solid waste, nuclear)	221119
Power generation, fossil fuel (e.g., coal, gas, oil), electric	221112
Power generation, nonhazardous solid waste combustor or incinerator electric	562213
Power measuring equipment, electrical, manufacturing	334515
Power transformers, electric, manufacturing	335311
Power transmission equipment, electrical, merchant wholesalers	423610
Substation transformers, electric power distribution, manufacturing	335311
Transformer station and substation, electric power, construction	237130
Transformers, electric power, manufacturing	335311
Transmission of electric power	221121
Utility line (i.e., communication, electric power), construction	237130
Voltage regulating transformers, electric power, manufacturing	335311
Wind generated electrical power regulation	926130
Windmills, electric power, generation-type, manufacturing	333611

Renewable Energy NAIC Codes

Wind

Fabricated Structural Metal Manufacturing	332312
All Other Plastics Product Manufacturing	326199
Speed Changer, Industrial	333612
Electronic Equipment and Components, NEC	335999
Power Transmission Equipment	333613
Iron Foundries	331511
Measuring and Controlling Devices	334519
Motors and Generators	335312
Industrial and Commercial fans and blowers	333412
Printed circuits and electronics assemblies	334418

Solar

Electronic Equipment and Components, NEC	335999
Current-Carrying Wiring Device Manufacturing	335931
Plastics Material and Resin Manufacturing	325211
Unlaminated Plastics Film and Sheet (Except Packaging)	326113
Instrument Manufacturing for Measuring and Testing	334515
Sheet Metal Work Manufacturing	332322
Switchgear and Switchboard Apparatus Manufacturing	335313

Geothermal

Industrial and Commercial fans and blowers	333412
Iron and Steel Pipe and Tube Manufacturing	331210
Power Boiler and Heat Exchanger Manufacturing	332410
Overhead Traveling Crane, Hoist, and Monorail System	333923
Air-Conditioning and Warm Air Heating Equipment	333415
Pump and Pumping Equipment Manufacturing	333911
Air and Gas Compressor Manufacturing	333912
Metal Tank (Heavy Gauge) Manufacturing	332420

Biomass

Air Purification Equipment Manufacturing	333411
Power Boiler and Heat Exchanger Manufacturing	332410
Iron and Steel Pipe and Tube Manufacturing	331210
Conveyor and Conveying Equipment Manufacturing	333922
Industrial and Commercial fans and blowers	333412
Electronic Equipment and Components, NEC	335999
All Other Miscellaneous General Purpose Machinery	333999
Air-Conditioning and Warm Air Heating Equipment	333415
Switchgear and Switchboard Apparatus Manufacturing	335313
Metal Tank (Heavy Gauge) Manufacturing	332420
Instruments and Related Products Manufacturing	334513
Pump and Pumping Equipment Manufacturing	333911
Overhead Traveling Crane, Hoist, and Monorail System	333923
Scale and Balance (except Laboratory) Manufacturing	333997
Construction Machinery Manufacturing	333120
Fluid Power Cylinder and Actuator Manufacturing	333995
Air and Gas Compressor Manufacturing	333912
Power, Distribution, and Specialty Transformer Manufacturing	335311

**ATTACHMENT 2
SUPPLEMENTAL TABLES**

Fossil Fuels and Related Equipment Tables

Spot Price



**Top 50 Oil and Gas Companies
December 2008**

Rank2007	Rank2006	Company	Country	State Ownership %
1	1	Saudi Aramco	Saudi Arabia	100
2	2	NIOC	Iran	100
3	3	Exxon Mobil	US	
4	5	PDV	Venezuela	100
5	7	CNPC	China	100
6	4	BP	UK	
7	6	Shell	UK/Netherlands	
8	8	ConocoPhillips	US	
9	9	Chevron	US	
10	10	Total	France	
11	11	Pemex	Mexico	100
12	12	Sonatrach	Algeria	100
13	12	Gazprom	Russia	50.0023
14	14	KPC	Kuwait	100
15	15	Petrobras	Brazil	32.2
16	24	Rosneft	Russia	75.16
17	18	Petronas	Malaysia	100
18	16	Adnoc	UAE	100
18	17	Lukoil	Russia	
20	19	NNPC	Nigeria	100
21	19	Eni	Italy	30
22	21	QP	Qatar	100
23	23	Libya NOC	Libya	100
24	22	INOC†	Iraq	100
25	29	Sinopec	China	71.84
26	28	StatoilHydro	Norway	62.5

27	26	EGPC	Egypt	100
28	25	Repsol YPF	Spain	
29	27	Surgutneftegas	Russia	
30	30	Pertamina	Indonesia	100
31	31	ONGC	India	74.14
32	34	Marathon	US	
32	32	PDO	Oman	60
34	37	EnCana	Canada	
34	--	Uzbekneftegas	Uzbekistan	100
36	36	Socar	Azerbaijan	100
37	35	SPC	Syria	100
38	39	Ecopetrol	Colombia	89.9
39	42	Apache	US	
39	44	CNR	Canada	
41	37	Anadarko	US	
42	41	Devon Energy	US	
43	40	TNK-BP†	Russia	
44	43	OMV	Austria	31.5
45	48	Hess	US	
46	44	Occidental	US	
47	47	BG	UK	
48	51	CNOOC	China	66.41
49	50	Inpex	Japan	29.35
50	52	Kazmunaigas	Kazakhstan	100

Source: Petroleum Intelligence Weekly, December 2008

Key Prospective Countries for Oil and Gas

Country	Oil reserves (billion barrels)	Gas reserves (trillion cubic feet)
Iraq	115.0	111.94
Russia	60	1,680
Libya	41.5	50
Kazakhstan	30	100
Nigeria	36.2	183.9
Brazil	12.18	-
Angola	9.0	-
Equatorial Guinea	1.1	-
Turkmenistan	.6	100

Source: EIA World Proved Crude Oil and Natural Gas Reserves, January 2008

Leading Markets for U.S. Exports of Oil and Gas Equipment, January-November 2008 (NAICS 333132)

Country	Exports (Thousand dollars)
Singapore	1,237,304
UAE	638,348

China	619,656
Brazil	608,525
United Kingdom	534,832
Angola	523,203
Venezuela	474,067
Saudi Arabia	451,752
Russia	379,301
Korea	360,036
Colombia	356,596
Mexico	333,943
India	314,482
Nigeria	277,844
Egypt	257,734
Australia	234,623
Canada	228,890
Trinidad & Tobago	201,891
Argentina	191,229
Algeria	186,709
Norway	162,142
All others	4,101,450
Total	11,437,253

Source: Census Bureau