



Global Energy-Related Topics and their Economic Impact on Illinois

by Dave Bieneman, Ph. D.

Introduction

Shifts in energy supply or demand can influence world prices which impact all levels of the economy. For example, the 1973-74 Organization of Petroleum Exporting Countries (OPEC) oil embargo reduced the flow of oil to the U.S. and other big importing countries, which forced oil prices higher, leading to inflation and a national recession with high unemployment and

a shrinking economy. The current global energy situation is significantly different: an increasing supply of oil driven primarily by U.S. fracking operations and decreasing world energy demand has resulted in lower oil and gas prices.

Our energy options have become broader over time. First, wood was used for fire, light and heat. Then more efficient power sources were found including oil, natural gas and coal. Eventually these sources

“Energy is the ‘oxygen’ of the economy and the life-blood of growth”

Peter Voser (CEO of Royal Dutch Shell and the Energy Community Leader for the 2011-2012 World Economic Forum)¹

were used to create steam power which, in addition to other applications, had the power to turn turbines to create electricity. Electricity was also produced by water turning turbines and via nuclear power stations. Gasoline has propelled automobiles and other fuels have allowed aircraft to fly.

Now we are developing new sources of electricity generation which tend to be cleaner and more renewable and are increasing in market share. These sources include wind, solar, and geothermal. Biofuels could diversify the sources used as inputs for transportation vehicles.

Oil and Natural Gas

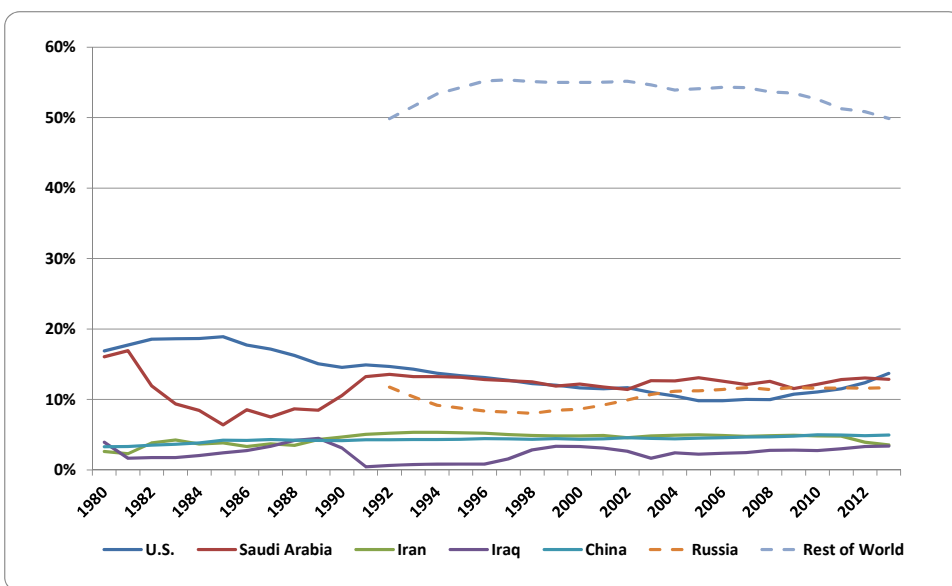
The federal government created the Energy Research and Development Administration (the predecessor of the

Department of Energy) in 1974. This was the result of the OPEC oil crisis, which quadrupled world oil prices, and raised the level of U.S. government investment in developing new energy technologies. Fracking, or hydraulic fracturing, is the process of injecting fluids into cracks to create fractures in rocks and rock formations. The larger fissures allow more oil and gas to flow out of the formation so it can be extracted. The original interest in the development of fracking technologies was to tap into shale deposits in order to extract natural gas.

When natural gas prices fell, producers realized that they could utilize the same technology to extract oil. Now oil prices have fallen and so have gasoline prices. The reduction in gasoline prices has cut costs for consumers, who appear to be spending at least part of this savings on other goods and services, giving a bounce to the economy.

As **Exhibit 1** shows, the United States passed Saudi Arabia in 2013 as the largest producer of oil (includes crude oil, natural gas plant liquids, and other liquids). The U.S. was the number one producer in the 1980s and early 1990s, but production was roughly equal between the U.S. and Saudi Arabia from 1994 through 2002 with Saudi Arabia then taking the lead until 2013. Russia is a close third with the three countries together producing 38.2 percent of the world’s oil in 2013. When China, Iran, and Iraq are included, the six countries combined to produce 50.1 percent of the world’s oil in 2013. The increase in production for the U.S. from 2006 to 2013 was 48.4 percent using annual production data.

Exhibit 1. World Oil Production Share (%) Data



Source: Energy Information Administration

Looking at crude oil production separately (only state data available), four states account for more than the total increase in U.S. production (2.36 million barrels per day) between 2006 and 2013. Those four, Texas (59.9%), North Dakota (30.9%), New Mexico (4.6%), and Colorado (4.6%) accounted for an increase of 2.43 million barrels per day over those same years.² Much of the increase in production for those four states is due to fracking.

Exhibit 2 shows that the United States also produces approximately 20 percent of the world's natural gas, down a few percentage points from the early 1990s as more countries around the world have developed their resources. Russia is the world's second largest producer, a few percentage points behind the U.S. When including Iran, Algeria and Canada the top five natural gas producers accounted for 49.9% of production in 2012.

Supply and Demand

Current oil prices (spot) dropped from over \$100 a barrel (July 2014) to less than \$50 (January 2015) in six months, but prices for future oil contracts expiring a couple of years from now have not fallen as far. Many analysts argue that investors would be better off looking at the futures' price when making long-term investment decisions. One example of an industry making such an investment would be airlines³ who are very concerned about the fuel price a couple of years into the future.

Economists have different opinions regarding the reason for the decline in oil prices: excess supply or shrinking demand. Many attribute the bearish oil market for an excess supply of oil, identifying the shale industry in North America as a catalyst. But declining demand in major economies, notably China, Russia and Brazil, has clearly

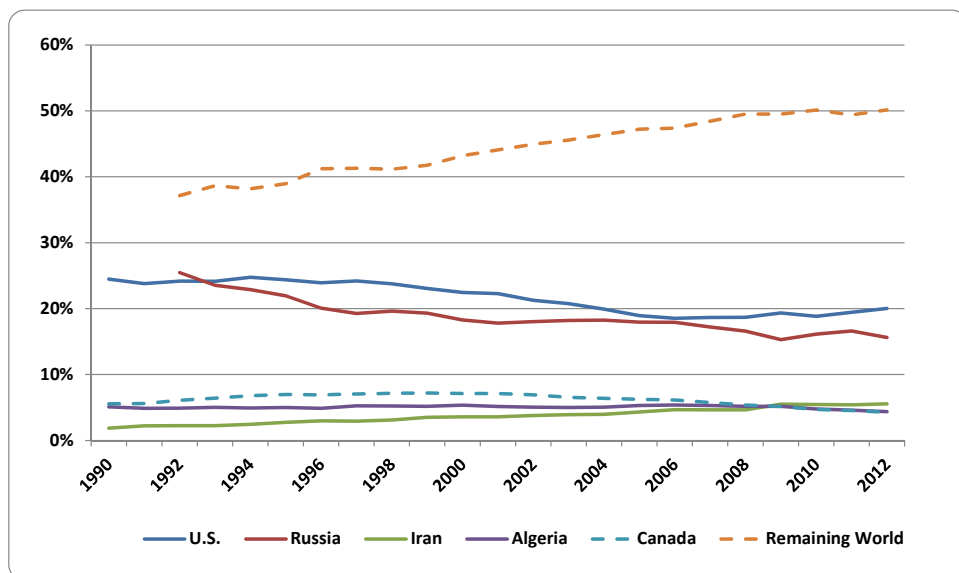
aggravated the situation.⁴ As the world's largest consumer of energy, a slowdown in economic growth in China has had a large negative impact on the overall demand for oil. China is beginning its third year of slowing economic growth in 2015.⁵ In reality, the situation has developed as a combination of both excess supply and shrinking demand.

As the economies of China and Brazil are slowing it appears that the drop in oil prices (in addition to economic sanctions) may push Russia into a recession.⁶ India, on the other hand, appears to be headed toward strong economic growth. A new government has established business-friendly policies and the country's reliance on oil imports is now less of a problem with cheap oil available. Big companies are looking to expand beyond China and into countries such as India.

The OPEC countries, led by Saudi Arabia, have decided not to cut production in order to put upward pressure on prices, but instead focus on maintaining their share of the market. Since Saudi Arabia has the lowest oil production costs, and also has a large amount of money in reserve, they can survive the lower market prices more easily than countries such as Russia and Iran. Thus, if the Saudis cut production, some other producer would fill the gap by selling their oil on the market. Since the Saudis are the lowest-cost producer it makes no sense for them to give up a portion of their market share to a higher-cost producer.

The increase in production due to fracking would likely continue if oil prices had remained high. Falling prices

Exhibit 2. World Natural Gas Production Share (%) Data



Source: Energy Information Administration

may delay many new projects and some existing projects may shut down. The survival of each oil production facility is dependent on its cost of producing a barrel of oil relative to the market price.

Many in the oil industry believe that the price of a barrel of oil is unlikely to rise to \$100 in the near future. The popular opinion is that oil prices per barrel will settle in the \$65 to \$70 price range over the next several years⁷ – a price where most (but not all) fracking projects of shale oil will continue to operate. It is believed that about 60% of oil shale basins in the country that utilize fracking can operate at a price of about \$65.

OPEC's Secretary-General believes that the drop in the price of oil could lead to a shortage of investment toward future production. Since oil companies need to continually invest in new oilfields to replace production from declining fields just to maintain level output,

he believes a shortfall will eventually occur causing a spike in the price of oil, and thus gasoline. He believes that oil companies need to develop about 200 billion barrels of oil supplies over the next 15 years just to meet demand.⁸

In the short term the price of oil could fall as storage space for crude is currently in short supply. The cost associated with storage has increased and this has put pressure on those holding oil to dump their inventory. This is most likely to occur about the first half of 2015.⁹

Fracking Impacts on Other Economic Sectors

The increase in natural gas and oil production in the U.S. has led to growth in other sectors of the economy such as manufacturing, hospitality, real estate and some other services.¹⁰ For example, manufacturing employment in the area of northeast Ohio is growing for the



Job Opportunity:

Senior Geologist Salary: \$63,000

Capable of completing complex geological assignments, including integration of geological, geophysical, and reservoir engineering data to arrive at production characteristics of shale oil and gas resources.

Source: The Conference Board Help Wanted OnLine® Data Series (6/5/15)

first time in decades as the industry is producing equipment to be used for oil and gas production. This has had a positive impact on occupations in those areas of the country where fracking is underway, such as draftsmen, machine operators, and extraction and refinery jobs. Sand mines, such as those near Starved Rock State Park in Illinois have had an increase in economic activity as it is a source of a particular type of sand used in this process. A 2013 McKinsey study estimated that production of gas and oil from shale could help to create 1.7 million jobs nationally.

An energy company is currently converting a natural gas pipeline that runs underground through the tip of southern Illinois, north to Patoka. This would connect to a pipeline running

from production areas in North Dakota, through South Dakota and Iowa, into Illinois. The pipeline would then be able to carry domestically produced light crude oil to the area bordering the Gulf of Mexico.¹¹

By the time the permitting process associated with the Illinois fracking legislation was set [November 2014], oil prices had already started to drop. The timing could not have been worse for the Illinois industry. A spokesman for the Independent Petroleum Association of America mentioned the situation would be better if some wells had been drilled and oil had already been located making it easier for the industry to continue to drill other wells. As it stands the industry may not want to take the risk on Illinois right now and many leases for mineral rights could be allowed to expire.¹²

Much of the financing for companies in the oil business assumed higher oil prices when determining the ability to pay back loans. This could be a problem in the future as oil prices may increase somewhat but they are not likely, in the near term, to reach their previous level. It is hoped that the cost of producing wells via fracking will decrease as more experience is gained.

Tax revenues from oil and gas extraction will also be negatively impacted as less oil is likely to be produced in Illinois over the next few years. It had previously been estimated that the state would receive \$725,508 in taxes for each fracking well, assuming a life span of 10 years and an oil price of \$85 per barrel. A separate tax would have gone to local governments (based on the location of the well) and would have generated about \$555,481.¹³

Biofuels

Ethanol (1st Generation)

The weekly spot price, per gallon, for ethanol in Iowa fell to \$1.27 in the middle of January of 2015 from \$2.42 at the end of November 2014.¹⁵ A price that low leaves little room for profits and a cut in production of ethanol could follow. It also reduces the demand for corn, lowering the price of that commodity. Since more than a third of the nation's corn supply is used as an input to producing ethanol, farmers have to consider shifting their planting of crops away from corn and toward soybeans. If prices for oil and gas remain low then pressure could increase on ethanol producers. As of 2011 Illinois ranked third among all states in corn ethanol production (behind Iowa and Nebraska).

Cellulosic Ethanol (2nd Generation)

Cellulosic ethanol can be produced using a number of feedstocks. One example is cellulosic ethanol produced from corn cobs, leaves, husk, and some stalk (a.k.a. corn stover). Removing some of the stover from fields after harvest can actually reduce or remove the need for tilling excess stover back into the ground, likely improving productivity. The best approach seems to be that a certain amount of stover (regardless of yield from the harvest) should be left on the soil, and any excess above that amount should be removed.¹⁶

The POET-DSM's Project Liberty cellulosic ethanol plant in Emmetsburg, Iowa will produce 20 million gallons per year, eventually 25 million gallons, from corn stover. Their plan calls for

Biofuels made by converting food crops grown on prime cropland are considered 1st generation biofuels. 2nd generation biofuels are produced from marginal croplands unsuitable for food production or by using non-food crops and residues. Biofuels made using non-arable land that produce a feedstock as well as a fuel and require the destruction of biomass are considered 3rd generation fuels. 4th generation biofuels can be made using non-arable land, and do not require the destruction of biomass.¹⁴

Job Opportunity:

Senior Process Engineer Salary: \$90,000

Develop bioprocesses, participate in transfer and scale-up of biofuel technology from bench to commercial scales.

Source: The Conference Board Help Wanted OnLine® Data Series (6/5/15)

removing one ton of biomass out of the average 4.26 tons available per acre. This will not require any major changes in fertilizer management for the associated farmers.¹⁷

A study has been conducted by DuPont Cellulosic Ethanol and Iowa State University regarding the cost of bringing corn stover from the field to cellulosic ethanol plants. The DuPont facility (near Nevada in central Iowa) plans to produce 30 million gallons of liquid fuel annually. That amount of production will require 900,000 large square bales (3'x4'x8') of corn stover, each weighing about one ton. This would require 25,000 truckloads of bales delivered to the facility each year. The study concludes that the amount of fuel used for transporting the bales from the field to the production facility is about 2 gallons per ton, while each ton of stover will be used to produce about 80 gallons of fuel.¹⁸

Now that cellulosic ethanol facilities are being put into commercial production, the need for biofuel feedstock will rise. One thousand facilities that produce 20 million gallons per year would produce a total of 20 billion gallons of cellulosic biofuel. The first few facilities constructed had their location chosen because of the availability of the agricultural feedstock.¹⁹

As future locations for facilities are chosen it becomes more likely that the cost of acquisition and transport for the feedstock will increase. So the factor of diminishing returns should be considered for cellulosic biofuels

because only a certain number of production facilities may be able to operate at a profit.

Plans for a cellulosic ethanol refinery in Illinois have been made by Patriot Renewable Fuels in the northwestern Illinois town of Annawan. The plant will produce 25-30 million gallons per year of cellulosic ethanol with an additional 175,000 tons of lignin (an organic polymer that serves as an excellent fuel), which will be used to generate power to run the plant. The new facility will be co-located on the site of Patriot's current grain ethanol plant, which produces 110 million gallons per year.²⁰ The project will provide construction jobs and other permanent positions in the plant such as production maintenance, transportation, and office jobs.

Recent research from the Energy Biosciences Institute at the University of Illinois showed that fast-growing energy grass miscanthus was superior to switchgrass and corn stover for yields and costs associated with producing ethanol.²¹ One reason for interest in a feedstock such as miscanthus is that it can be grown in poor-quality soil so that it would not compete for land with food crops. Research showed that miscanthus outperformed switchgrass and corn stover in its ability to reduce greenhouse gas emissions.

Butanol

Ethanol dominates the \$26 billion dollar renewable fuels market as the country's primary fuel additive. In the future butanol may take market share away from ethanol. Butanol can be produced from corn and other types of biomass. Improvements in production methods have now allowed for the commercialization of this technology.



Ethanol plants could be modernized to produce butanol from corn at a rough cost of \$15 million per plant.²²

Butanol appears to have several advantages over ethanol. Inefficiency is present in existing ethanol facilities because the blend of ethanol and gasoline cannot be shipped via pipeline, which results in the extra cost of the blending step done at the terminal (one to three cents per gallon of gas).²³ Butanol has the ability to be shipped via pipeline and the versatility to be used as a blendstock with gasoline or converted to other valuable products. It has properties that make it easier to blend with gasoline as fuel specifications allow for butanol to be blended to 16% by volume versus the 10% by volume for ethanol.²⁴

The butanol blend is less corrosive, and can use the industry's existing distribution structure. Ethanol will separate from gasoline when it comes into contact with water, whereas butanol will not. One concern for small engines and marine fleet engines is that the operating temperature of the engine is higher when the fuel includes ethanol as compared to butanol. Butanol also produces less greenhouse gas emissions than ethanol. Butanol can be used as a platform for producing rubbers, solvents, plastics and jet fuels. Butanol also contains 84 percent of the energy content of gasoline, more than ethanol's 66 percent.

Aviation Biofuel

The air transport industry is pushing for the production of a sustainable alternative to conventional jet fuel. Requirements include the ability to mix up to 50% of the alternative fuel with

conventional jet fuel; the ability to use the same supply infrastructure while not requiring adaptation of the aircraft (drop-in fuel); and to meet the same temperature and energy content specifications.²⁵ The industry wants these biofuels to only be made from sustainable, non-food biomass sources.

More than 20 billion gallons of jet fuel annually are required to support U.S. commercial aviation and the U.S. military. The military is the largest single consumer of jet fuel, but still accounts for less than half of the total.²⁶ By making a commitment to use aviation biofuel as part of their supply the military is helping to support the fledgling aviation biofuels industry. Determining the feedstock that is used as an input is critical in order to avoid a competitive market situation with other products that may use the same feedstock as an input.

Advanced Biofuel (3rd and 4th Generation)

Hydrothermal algae liquefaction (HTL) is a developing technology for converting whole algae into biocrude, fuel gas, and usable byproducts. This process doubles the yield of biofuel from algae and cuts the cost of production by 86 percent. The design of the pilot facility uses heat, pressure, and catalysts to chemically and physically convert wet feedstocks into natural gas

A 1,000 acre production plant will be built in 2017 that could produce up to 15,000 gallons of diesel fuels, per acre, per year or as much as 25,000 gallons of ethanol, per acre, per year.

or oil that can then be further refined into aviation fuel, gasoline, and diesel.²⁷

The HTL process can be used in conjunction with a catalytic hydrothermal gasification (CHG) process to produce a biocrude ready for upgrade to fuels. These two steps are part of a strategy for reducing the cost of producing drop-in algae fuels from \$24 to \$7.50 per gallon. The Department of Energy (DOE) has set a target to reduce the cost to \$5 per gallon by 2019 then reduce the cost further to \$3 per gallon. Issues still exist with the current technology but significant progress has been made.

A survey conducted in February 2015 by the Algae Biomass Organization provides some interesting observations from people involved in the industry. Many respondents believe that fuels derived from algae will cost below \$5 per gallon by 2020 with about half

of the respondents believing that the prices will have dropped below \$3 per gallon by that time. Almost all of the respondents believe that co-products such as feed, food and chemicals will be commercially available by 2020.²⁸

Joule Unlimited Inc., in New Mexico, has developed a unique biofuel technology called Helioculture. They have created a breakthrough photosynthetic process that produces drop-in fuels using industrial waste carbon dioxide (CO₂), feedstock, waste water, and cyanobacteria. The process secretes transportation fuel that does

not need to be refined. The technology does not require biomass and does not require a significant amount of arable land.²⁹

A 1,000 acre production plant will be built in 2017 that could produce up to 15,000 gallons of diesel fuels, per acre, per year or as much as 25,000 gallons of ethanol, per acre, per year. This would result in 15 to 25 million gallons of biofuel produced by the first commercial facility. Once the fuel is harvested it is ready to be used in a car or a jet. The solar-to-product conversion efficiency of Joule Unlimited's direct,

continuous process for producing diesel, ethanol and chemicals is between 5 and 50 times greater than any biomass-dependent process. It gains additional efficiencies by skipping the refining process.

Biomanufacturing

Using similar chemical processes as biofuel, biomanufacturing uses organic materials to replace chemical compounds typically produced from petroleum, for producing plastics.

Only about 10 percent of plastic generated each year is recycled. The rest becomes trash or becomes a pollutant in the environment. A technology to convert carbon dioxide and methane into plastic is emerging as one potential solution that can be less expensive than producing plastics from oil.³⁰

The greenhouse gas to plastic conversion technology is based on microorganisms that feed on methane or carbon dioxide. The microbes accumulate a biopolymer inside their cell walls as they feast producing a powder form substance. After it is pelletized it can be used to make other plastic goods. Methane sources such as landfills and wastewater treatment plants used for making plastic are much more economical than using the gas for heat or electricity. The biopolymer is biodegradable.

Wind

According to the most recent data (2013) from the American Wind Energy Association (AWEA), Illinois ranks fifth for total megawatts (MW) installed (3,568 MW from 2,195 turbines) for wind power although the state has only

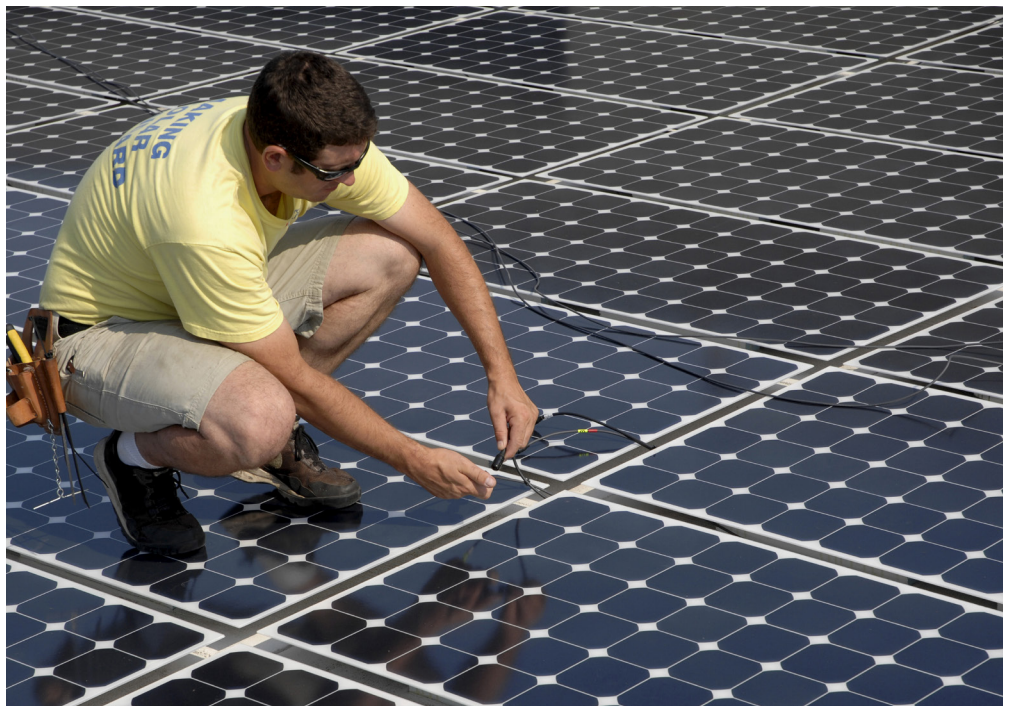


Job Opportunity:

Wind Farm Travel Technician Salary: \$39,000

Travel to wind farm sites to perform advanced maintenance work on wind turbines. Work may include large electrical troubleshooting or blade repair work. Technicians troubleshoot turbine systems and replace parts if necessary in a safe and professional manner.

Source: The Conference Board Help Wanted OnLine® Data Series (6/5/15)



Solar

The next renewable energy sector to experience a breakthrough in growth may be solar energy. The cost of making solar modules has been reduced to a point where it can compete with other forms of electric power in many parts of the U.S. The economics for large-scale solar installations are already on par with gas combined-cycle and combustion plants in California and other states. This status is expected to continue to spread to other states in the nation. Consultant Wood Mackenzie expects solar to account for 6 percent of the nation's energy by 2035, compared to 1 percent that is produced by solar currently.³⁴

The University of Illinois has finalized plans to build a solar farm at the university campus in Champaign. The farm will provide 5.87 Megawatts of power, or about 2 percent of the campus' electric demand. The project

helps the university toward its goals in its climate action plan.³⁵

The White House has initiated a new program that will train veterans on the installation of solar panels at military

Job Opportunity:

Technician Salary: \$45,000

You will be a part of the team responsible for managing, operating, and maintaining the company's fossil, renewable (wind and solar), and hydroelectric fleet of power generating assets.

Source: The Conference Board Help Wanted OnLine® Data Series (6/8/15)

the 15th best wind resource in U.S. Illinois has 37 manufacturing facilities related to the wind power industry out of a total of over 500 nationwide.³¹

Illinois may also soon tap into wind power from neighboring states. Five energy transmission lines are proposed by Clean Line Energy to carry wind-generated power from plains states to areas of larger population.³² Two of those involve Illinois: 1) the Rock Island, which runs 500 miles from northwest Iowa to Grundy County in Illinois; and 2) the Grain Belt Express, which would run from western Kansas through Missouri and central Illinois to Indiana.³³ The Illinois Renewable Portfolio Standard (RPS) requires the state to obtain 25 percent of its energy from renewable sources by 2025.



The price of oil is expected to remain relatively low for the next few years. This in turn means that the price of gasoline is expected to remain relatively low.

compounds. The program will take place at ten military bases across the country. President Obama will state a new administration goal of training 75,000 new solar workers in the next five years. Veterans trained at the military bases will be included in that count.³⁶

Nuclear

Illinois is ranked first in the nation in the generation of electricity from nuclear power. The state produces approximately one-eighth of the nation's nuclear power generation, which is about half of Illinois' net generation of electric power. In 2015 Chicago-based Exelon will announce whether it will close nuclear plants that are struggling to compete against wind and natural gas-generated power.³⁷ The company is hoping that state lawmakers will pass legislation by the end of May 2015 that will reward them for producing electricity without emitting carbon.

Coal and FutureGen

Coal's share of the country's power generation is expected to fall from 41 percent (under existing regulatory rules) to 33 percent in 2020 and 30-31 percent in 2030 due to the Obama administration's new rules limiting carbon dioxide emissions and the increase in domestic shale gas production.³⁸ Ironically, the Illinois Basin's (Illinois Basin stretches from Illinois to parts of Ohio and Western Kentucky) share of U.S. coal production is expected to rise from 13 percent currently to 20 percent by 2040 according to the U.S. Energy Information Administration.

Currently 72 percent of coal power plants in the U.S. have scrubbers to remove contaminants. Some plants will be closed and others will be modernized to include the scrubbers so that 100 percent of coal plants will have them by 2025. Since the scrubbers can clean Illinois' "dirty coal", a mix of factors will now be in Illinois' favor and increase the demand for its coal. The combination of mining costs, heat content, and lower shipping costs due to central location make the Illinois Basin coal more competitive under the new rules. Combined statewide employment for "Coal Mining" (NAICS 2121) and "Support Activities for Coal Mining" (NAICS 213113) is currently over 4,000 according to Quarterly Census of Employment and Wages (QCEW) data.

The DOE recently suspended the FutureGen clean-coal project in western Illinois. The decision was based on the DOE's determination that the project could not meet a deadline to spend one billion dollars in federal stimulus money toward the project.³⁹

Energy Storage

The evolution of energy storage is extremely important for intermittent power generating sources such as solar and wind. The more advanced energy storage becomes, the larger the market share could become for both resources. The importance of balancing services, in turn, will become more important as the demand for solar and wind energy increases. A critical role for energy storage is saving energy from the time it is generated (sunlight and windy conditions) for the times it is needed by consumers. Energy storage is an important component of the energy

system and should be built into utility resource plans.⁴⁰

Renewable Energy Systems Americas Inc. (RES Americas) is building two grid-scale energy storage projects outside of Chicago. Once completed in the summer of 2015, they will be the largest, fully commercial energy storage projects in North America. The two energy storage systems will each have the ability to store 7.8 megawatt-hours of energy. One (named “Elwood”) will



Job Opportunity:

Energy Engineer Eco Salary: \$90,000

Identify innovative solutions to reduce energy, waste, and operating costs throughout a building’s life cycle. Perform and supervise facility audits that identify energy and water conservation opportunities. Screen and qualify the feasibility of energy efficiency and renewable energy opportunities. Recommend energy-efficient design solutions and technology upgrades.

Source: The Conference Board Help Wanted OnLine® Data Series (6/8/15)

be located in West Chicago, while the other (“Jake”) will be located in Joliet. The projects are interconnected to the local Commonwealth Edison (ComEd) electric grid. They will balance the second-to-second variations in load and generation by absorbing excess energy during moments of over-generation and releasing energy during periods of under-generation to preserve power quality.⁴¹

Energy Efficiency

No list of energy topics is complete without discussing energy efficiency. The main purpose of efficiency is to eliminate a significant portion of energy that would be consumed in a wasteful manner, eliminating the need for some power generation projects.

The U.S. Green Building Council (USGBC) released its annual list of the Top 10 States for LEED (Leadership in Environmental and Energy Design) in February 2015. Illinois retained the number one spot for the second year in a row. Colorado, Maryland, Virginia, and Massachusetts rounded out the

top five. The rankings were based on a per-capita list of commercial and institutional green building projects that were LEED certified in 2014.⁴²

Smart Grid

Work is proceeding on utility’s capital investments in a Smart Grid. Both Ameren (downstate Illinois) and ComEd (northern portion of Illinois including Chicago) are seeking legislation to extend the date utilities must have the program’s progress reviewed by the legislature. The utilities would like to have a full year’s worth of smart meter data to review the impact of the advances in technology.⁴³ Employment in Illinois’ “Power and Communication Line and Related Structures Construction” (NAICS 237130) industry has risen about 2,000 between 2010 Q1 and 2014 Q3 (QCEW), which is almost a 50 percent increase.

Conclusion

One current energy issue is an increasing supply of oil driven

primarily by U.S. fracking operations and a decreasing global demand for energy resources. Since the U.S. is now the world's leading producer of both oil and natural gas the nation has become more energy independent. The investment in alternative sources of energy generation raises the level of that independence. Having a stable, low-cost energy supply is a key component to the long-term future of the economy.

The price of oil is expected to remain relatively low for the next few years. This in turn means that the price of gasoline is expected to remain relatively low. This could help the economy by redirecting consumer spending from energy products to other consumer goods while allowing employers to cut their costs. Oil prices per barrel are expected to settle in the \$65 to \$70 price range over the next several years.



The increase in domestic natural gas and oil production from fracking have led to national employment growth in other sectors of the economy such as mining, manufacturing, construction, hospitality, real estate and occupations related to those industries. Many of these occupations pay good wages. However, the recent changes in the oil industry could slow the growth of the Illinois fracking industry. Drilling will be pursued only when operators can feel confident that they can do so without suffering financial losses. State and local governments still hope to collect new tax revenues from this budding industry.

The mix of sources generating electricity has become broader and technology is on the verge of supplying new sources of fuel for transportation vehicles. The newer sources, including wind, solar, geothermal, and biofuels, tend to be cleaner and more renewable and are increasing in market share. The continued development of alternative forms of energy would allow the country to move toward long-term environmental goals as well as building a strong foundation for the national economy.

Illinois has already benefited by participating in the production of biofuels and in the wind power generation industry. Perhaps a new generation of biofuels could increase Illinois' involvement in that industry. The potential for increasing growth in biomanufacturing and the solar power generating industry also appears to be present in

Illinois. Again the recent changes in the oil industry could slow the biofuels industry. If oil prices stay low the biofuels industry may find it harder to compete and political support for the industry may languish.

Growth in the state's energy efficiency industry will occur if demand for these services continues to increase. A significant portion of any employment increase would show up in the professional services industry sector and related occupations.

At this time it is difficult to quantify employment growth or expected growth in Illinois for many of these energy-related industries. Most of the jobs that do become available will likely fall in the following occupational categories: 1) (SOC 17-0000) Architecture and Engineering Occupations; 2) (19-0000) Life, Physical, and Social Science Occupations; 3) (45-0000) Farming, Fishing, and Forestry Occupations; 4) (47-0000) Construction and Extraction Occupations; 5) (49-0000) Installation, Maintenance, and Repair Occupations; 6) (51-0000) Production Occupations; and 7) (53-0000) Transportation and Material Moving Occupations. Information on expected wages can be found at the Occupational Employment Statistics (OES): Wage Information Web page at: http://www.ides.illinois.gov/LMI/Pages/Occupational_Employment_Statistics.aspx.

Dave Bieneman is Manager of Economic Analysis for the Illinois Department of Employment Security.

End Notes

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