

Renewable Energy's Place in the High Energy Cost Picture

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Trends in energy supply and demand are affected by many factors that are difficult to predict, including energy prices, U.S. and worldwide economic growth, advances in technologies, and future public policy decisions both in the United States and in other countries. Energy markets are changing in response to a number of observable factors, which include: higher energy prices; the growing influence of developing countries on worldwide energy requirements; recently enacted legislation and regulations in the United States; changing public perceptions on issues related to emissions of air pollutants and greenhouse gases and the use of alternative fuels; and the economic viability of various energy technologies. Energy prices which had been relative stable during the 1990s began to increase dramatically in the first decade of the 21st century (Figure 1).

Recent historical patterns of U.S. energy consumption by type of fuel provide an indication of trends. Figure 2 provides a 25 year history of energy consumption in the U.S. by type of fuels with projections to 2030. These projections are based on a continuation of current trends, but are subject to changing conditions and factors outlined above. A more detailed look at the energy picture is provided by the snapshot view for 2007 in Figure 3. The U.S. economy consumed 101.6 quadrillion BTUs of energy in 2007. Broadly, about 30 percent is used for transportation, 40 percent for electricity, 21 percent for industrial use and the remaining for residential and miscellaneous (Figure 4). Renewable energy sources currently make up about 7 percent of total energy use.

Most Renewable Energy Goes to Producing Electricity

Electricity producers consumed 51 percent of total U.S. renewable energy in 2007 for producing electricity. Most of the remaining 49 percent of renewable energy was biomass consumed for industrial applications (principally paper-making) by plants producing only heat and steam. Biomass is also used for transportation fuels (ethanol) and to provide residential and commercial space heating. The largest share of the renewable-generated electricity comes from hydroelectric energy (71 percent), followed by biomass (16 percent), wind (9 percent), geothermal (4 percent), and solar (0.2 percent). Wind-generated electricity increased by almost 21 percent in 2007 over 2006, more than any other energy source. Its growth rate was followed closely by solar, which increased by over 19 percent in 2007 over 2006.

http://tonto.eia.doe.gov/energy_in_brief/renewable_energy.cfm

Within the electric power sector, wind energy consumption has grown each year since 1998. From 2003 to 2007, wind's share of total renewable energy consumption increased from 2 percent to 5 percent. For the first time ever in 2007, wind energy consumption in the electric power sector exceeded geothermal. Hydro electricity accounted for 36 percent of total renewable consumption in 2007, down from 46 percent in 2003. However, hydro consumption is tied mostly to precipitation, which can vary year to year. Few plants are being built or retired.

How will our economy and consumers respond to this rapid change in energy? Based on economic theory, we can anticipate a reduction in quantity demanded through a

combination of short run and long run responses. When the price of a commodity, including energy, increases, we anticipate a reduction in quantity demanded and a substitution effect toward other alternatives. A review of gasoline elasticity studies (Espey) suggest a short run elasticity of about -0.26 (for a 10 percent increase in gas prices, quantity demand decreases 2.6 percent) as immediate strategies such as car-pooling, mass transit and less driving occurs. Elasticities for the longer run of 3 years or more are about 6 percent as consumers undertake longer run changes such as switching to more efficient vehicles or moving closer to work.

A recent Wall Street Journal article confirms this range of response by reporting that oil consumption in the U.S. dropped by 800,000 barrels for the first half of 2008. Price increases for other energy sources are also expected to stimulate similar searches for alternatives, new technologies, and conservation measures.

Prospects for More Renewable Energy

Renewable energy sources and generating technologies for electricity are environmentally benign compared with fossil fuel and nuclear technologies, but there are two main reasons limiting more renewable energy use. Renewable energy is expensive and capital-intensive and renewable resources are often not easily accessible.

Renewable energy plants are generally more expensive to build and to operate than coal and natural gas plants. Recently, however, some wind-generating plants have proven to be economically feasible in areas with good wind resources, compared with other conventional technologies, when coupled with the Renewable Electricity Production Tax Credit (described below).

Renewable resources are often geographically remote. The best renewable resources are often available only in remote areas, so building transmission lines to deliver power to large metropolitan areas is expensive.

Carbon dioxide emission implications of U.S. energy use

Prospects for more renewable energy increase as attention turns towards understanding and dealing with greenhouse gases, primarily carbon dioxide. Without capture and sequestration, carbon dioxide emissions from the combustion of fossil fuels are proportional to the carbon content of the fuel. Coal has the highest carbon content and natural gas the lowest, with petroleum in between.

The factors that influence growth in carbon dioxide emissions are the same as those that drive increases in fossil energy demand. Among the most significant are population and economic growth; increased penetration of computers, electronics, appliances, and office equipment; increases in commercial floor space; increases in highway, rail, and air travel; and continued reliance on coal for electric power generation.

The increases in demand for energy services are partially offset by efficiency improvements and shifts toward cleaner alternative energy sources and less energy-intensive industries. New carbon dioxide mitigation programs, more rapid improvements

in technology, or more rapid adoption of voluntary carbon dioxide emissions reduction programs could result in lower carbon dioxide emissions levels than projected here.

Policies Aim to Increase the Use of Renewable Energy

In addition to the incentive offered by rising energy prices, federal and state governments are offering several kinds of policies to increase the use of renewable energy.

Tax credits--The Renewable Electricity Production Tax Credit, a federal incentive, has encouraged a quadrupling of wind energy capacity over the past few years. These credits will expire at the end of 2008, as provided for under current law. Extension of the credit would increase the projected growth in renewable generation.

Targets--Many states have Renewable Portfolio Standards (RPS), which require electricity providers to generate or acquire a percentage of generation from renewable sources. However, many RPS programs have “escape clauses” if renewable generation exceeds a cost threshold. Some states have delayed compliance and others lack enforcement procedures. As a result, states may not always meet their RPS goals. The Energy Independence and Security Act of 2007 has set a 35 mile per gallon target for car manufacturers under the Corporate Average Fuel Economy (CAFÉ) provision.

Markets--A number of states, including Iowa, have built Renewable Energy Certificates/Credits (RECs) into their Renewable Portfolio Standards. This allows electricity providers to sell renewable energy certificates/credits and use their proceeds for renewable projects. Some states have made REC markets mandatory, requiring electricity providers to produce or acquire renewable generation to reduce reliance on fossil fuels to generate electricity.

Renewable fuels standard--The Energy Independence and Security Act of 2007 set forth a phase-in for renewable fuel volumes beginning with 9 billion gallons in 2008 and ending at 36 billion gallons in 2022. Fifteen billion gallons is targeted for corn ethanol, 16 billion gallons from cellulosic sources, and 5 billion gallons from advanced biofuels.

Table 1. Index of Energy Prices 1990-2008 (1990=100)

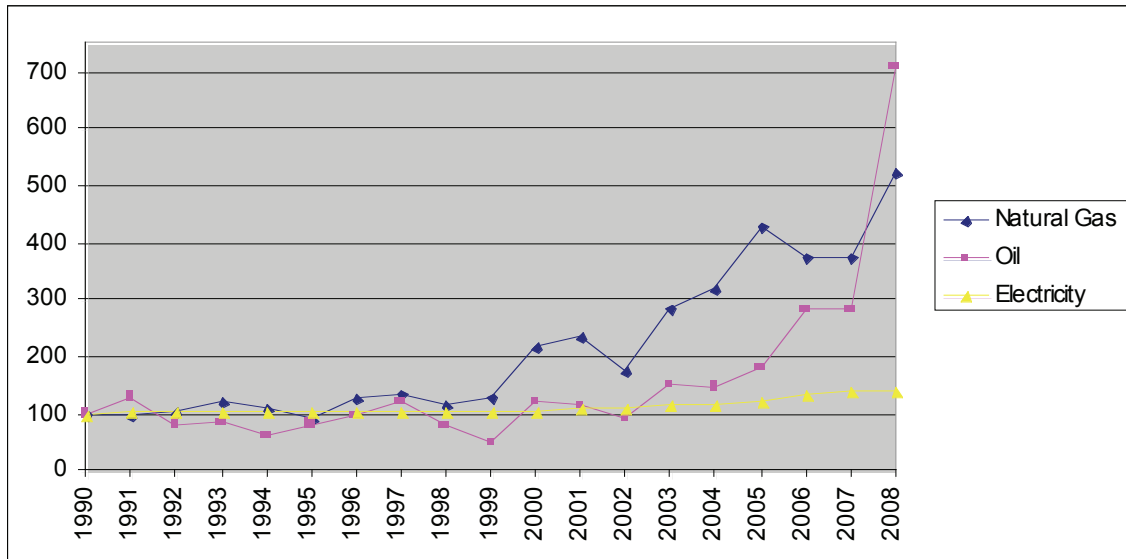


Figure 2. U.S. Energy Consumption by Fuel (1980-2030) (quadrillion Btu)

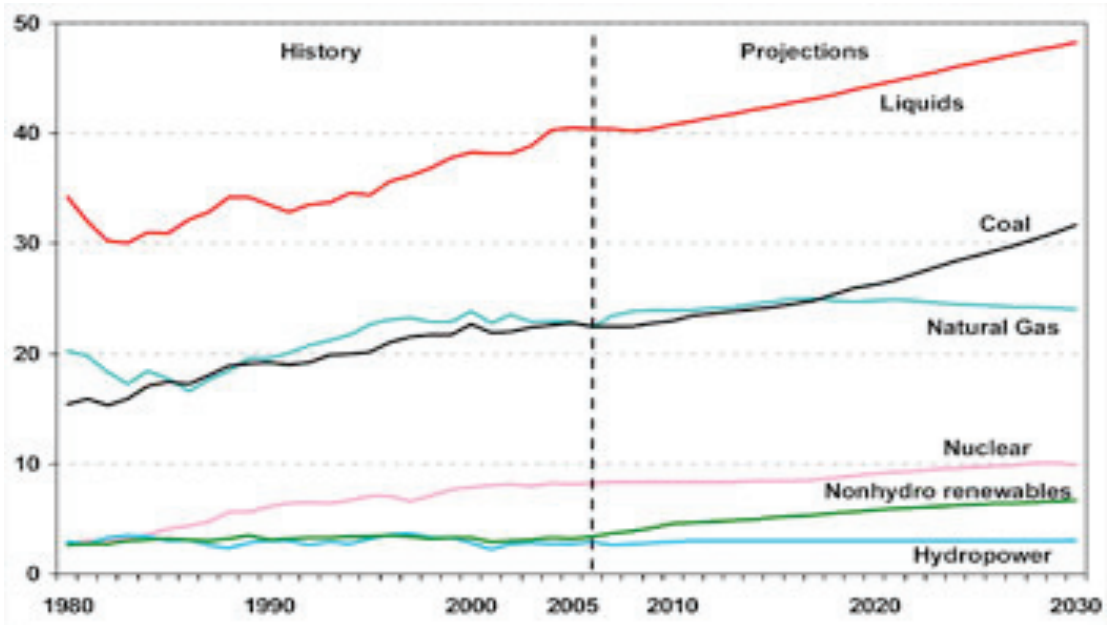


Figure 3. The Role of Renewable Energy Consumption in the Nation's Energy Supply, 2007

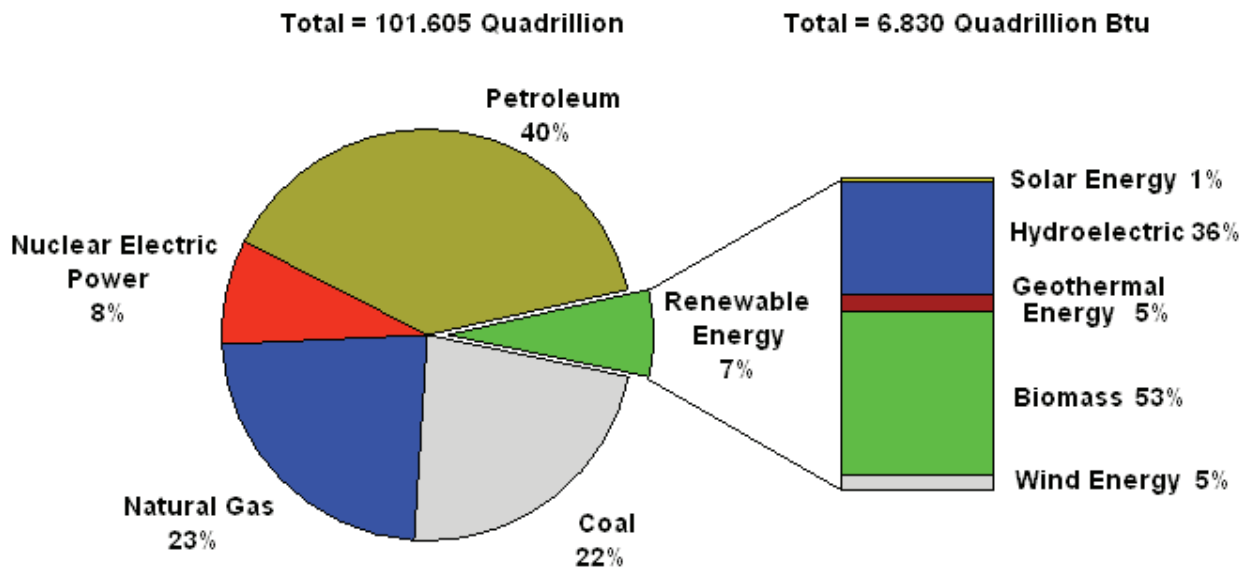


Figure 4. U.S. Primary Energy Consumption by Source and Sector, 2007 (Quadrillion Btu)

