Utah FOUNDATION Executive Summary

Report Number 685, May 2008

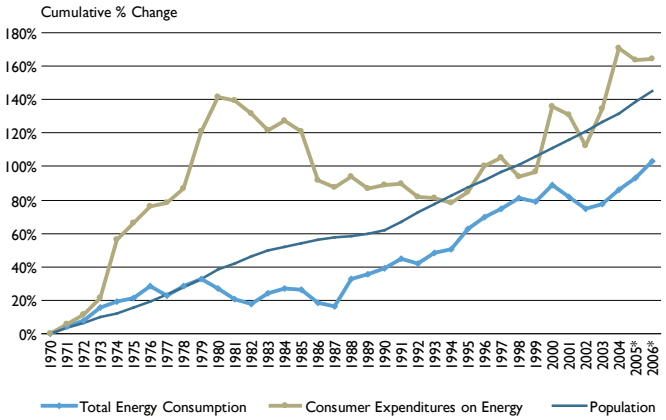
UTAH'S ENERGY USE & RESOURCES
POWERING OUR STANDARD OF LIVING

The quality of life that Utahns enjoy depends, in large part, on energy. Energy is a pervasive and ubiquitous component of our daily lives. Cooling our homes in the summer, heating them in the winter, watching TV, and driving our cars to work—all are activities that require energy of one type or another.

Figure 1 illustrates the changes in how much Utahns consume and spend on energy over time, compared to population growth. The graph indicates that consumption and expenditures have grown over time, together with population growth. Also notable is the fact that when expenditures have risen rapidly, consumption tends to decline. This is most evident in the time periods during the late 1970s, early 1980s, and in the early 2000s, when oil prices were rapidly increasing.

The main types of energy consumed in Utah are coal, natural gas, petroleum, and hydro electricity. Figure 2 shows the break-down of the sources of energy Utah consumes. Petroleum is the most largely-consumed energy source, with vehicles accounting for the majority of consumption. Coal and natural gas are used about equally, the former as Utah's primary source for electricity and the latter as the state's primary heating fuel.

Figure 1: Utah Energy Consumption, Spending, and Population Cumulative Percent Growth, 1970-2006



*2005-2006 expenditures are estimated, 2006 consumption is estimated.

Source: Utah Geological Survey.

OIL

Petroleum, also known as crude oil, is a flammable liquid comprised of hydrocarbons and other organic compounds that is naturally occurring and found in rock formations. Petroleum can be extracted from the earth and refined in order to produce fuel for heating, power generation, and motor fuel, which is by far its greatest use in Utah.[1]

While Utah currently has access to enough petroleum to meet its needs, prices are increasing and supplies are diminishing. Increases in population and wealth in Utah will probably result in increased demand for petroleum products, especially motor fuel. The increases in demand for gas and other petroleum products in Utah will end up competing with increased demand from other rapidly-growing areas in the United States, as well as with other nations across the globe. India and China, in particular, are experiencing significantly increasing demand.

Oil shale and tar sands are two alternate natural resources that can be converted *into* petroleum products. Utah contains some of the largest deposits in the world of both of these materials. While significant resources are required to extract them, these substitutes become more financially-viable resources as the price of traditional oil goes up. The problems facing the development of these resources include environmental damage from the extraction, production, and use of the material, as well as financial, technological, and ownership issues.

In addition to materials that can directly act as substitutes for oil, there are several technological developments that can be substituted for motor fuel by allowing automobiles to operate using non-oil-based motor fuels. The most prominent of these include electricity, fuel cells, bio fuels, and natural gas. Natural gas is a readily available and cheap motor

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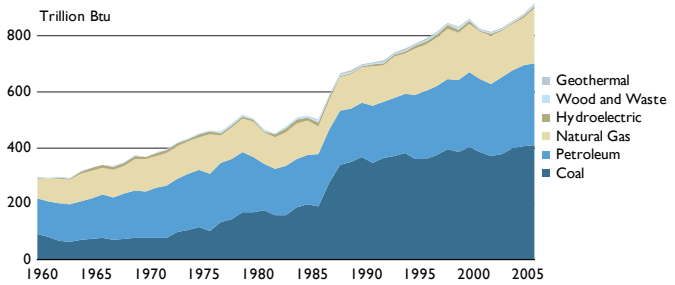
Figure 2: Energy Consumption in Utah by Fuel Type, 2006



Source: U.S. Energy Information Administration (EIA).

fuel in Utah that has few emissions. As of April 2008, the price of natural gas in Utah was a little over $0.60 per gallon of natural gas, compared to over $3.30 per gallon of regular gasoline.[2]

COAL

Coal is a combustible sedimentary rock that is the most widely distributed fossil fuel in the world. Ninety-two percent of all coal produced is used to generate electricity, which provides approximately half of all the electricity used in the U.S. In Utah, coal generates about 90% of all electricity; generating this electricity consumes 60% of the total coal produced in Utah.[3]

The demand for coal is expected to rise, given increasing demand for electricity. By 2030, U.S. demand for coal is expected to increase 48%. Worldwide demand for coal is projected to increase 73%, driven largely by increased energy consumption in China and India.[4]

Also, states adopting renewable portfolio standards, which require a certain percentage of electricity to be generated from renewable resources, could greatly affect demand for coal. Until technology develops to make these resources more cost-efficient, switching to natural gas or renewable energy for electricity could increase costs significantly in the short term.

NATURAL GAS

Natural gas is a fossil fuel comprised of methane and other gases. Natural gas is found in coal beds, natural gas fields, and oil fields. Over four-fifths of Utah households use natural gas for heating; however, Utah only consumes about one-half of its own production. The abundant gas supply in the Rocky Mountain region has and continues to provide Utahns with some of the least-expensive natural gas in the nation. If new reserves of natural gas are discovered and developed, Utah will be able to continue to rely on natural gas for heating homes and other uses for many years.

NUCLEAR ENERGY

Nuclear power is a source of energy derived from the fission (splitting) of atoms, rather than the burning of fuel, such as coal, to produce electricity. Nuclear power accounts for approximately 19% of total electricity generated in the U.S.[5] Utah neither generates, nor imports, power from nuclear power plants.[6] The byproducts of nuclear energy are cleaner than those produced by burning fossil fuels for power. Nuclear plants produce near-zero emissions of carbon dioxide, sulfur oxides, and nitrogen oxides. Nuclear energy production does not emit particles or ashes into the air, but it does produce solid waste byproducts that must be stored. While these waste products are small compared to the electricity produced, they require specific safety measures.[7]

While Utah does not currently have a nuclear power plant, there has been discussion of building a plant in Utah. Transition Power Development, LLC, is expected to submit an application to the U.S. Nuclear Regulatory Commission in 2010 for a new nuclear power plant to be built. The estimated construction costs of building a nuclear power plant in Utah run as high as $2-3 billion.

RENEWABLE ENERGY

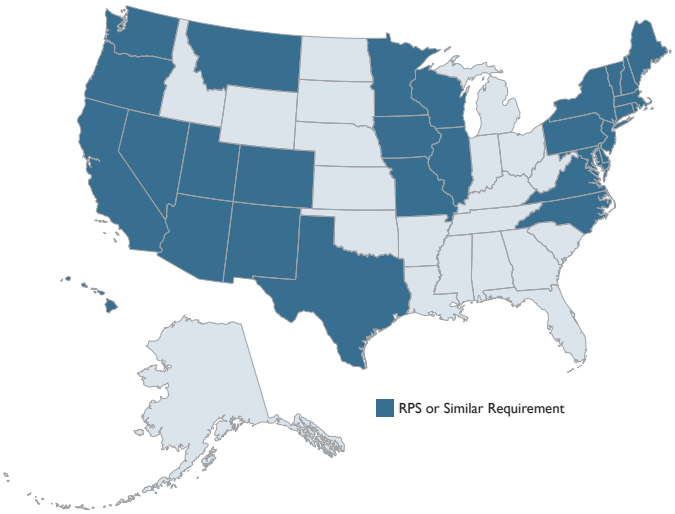
Often called "clean" or "green" energy, renewable energy is energy from natural resources, such as wind, plants, sunlight, rain, tides, and heat from the earth. The resources for renewable energy are not depleted with use or are replenished in a short amount of time, as opposed to other sources of energy, such as coal or natural gas. The U.S. has vast amounts of renewable resources available. The primary types of renewable energy include water, biomass, wind, solar, and geothermal.

Hydropower, the most common and least expensive renewable energy resource, generates electricity from flowing water; the amount that is produced depends on the amount of precipitation in any given year. While the availability of hydropower electricity fluctuates with rainfall, new technologies are being developed to harness the energy from ocean currents, tides, and waves.

Biomass energy is derived from non-fossilized material from plants, such as wood and wood waste, which are the largest sources of biomass energy. Municipal solid waste and alcohol bio fuels, mentioned earlier, are the next-largest sources of biomass energy.

Wind energy is harvested from wind turbines, which are modern versions of the windmill. Wind power is the fastest-growing energy technology in the world. Wind currently represents 3% of total renewable energy use in the U.S. and accounts for 5% of renewable energy sources consumed by the electric power sector.[8]

Figure 3: States With Renewal Portfolio Standards (RPSs) and Goals, as of April 2008



Note: Four of these states have adopted non-binding goals, rather than RPS: Utah, Missouri, Virginia, and Vermont.
Source: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE).

Solar energy is created from the collection and conversion of sunlight into heat and electricity. Ninety percent of solar energy is used to produce heat, with the remaining energy being used for electricity.[9]

Geothermal energy is extracted by drilling into the earth's surface. Heated steam or water then rises and powers steam turbines and electrical generators. Geothermal energy is used primarily for electricity and accounts for 6% of total renewable energy consumption in the U.S.[10]

There are several barriers to using renewable energy that must be addressed, such as its reliability and costs associated with production and transportation. As a result of these issues, the cost of renewable energy can be higher than other sources of energy. Also, the infrastructure that must be built to gather renewable energy—windmills or dams, for example—can have negative impacts on the landscape and wildlife habitats where they are located. Despite these concerns, the demand for renewable energy is expected to rise as the public becomes increasingly aware of diminishing fossil fuel supplies and environmental issues, such as climate change and air pollution.

Only a small portion of Utah's energy comes from renewable resources; in 2006, 2.3% of Utah's electrical generation was from renewable sources. In March 2008, Governor Huntsman signed the Energy Resource and Carbon Emission Reduction Initiative. The bill states that beginning in 2025, 20% of the adjusted sales from electrical corporations and municipal utilities must come from renewable sources, if cost effective.[11]

By April 2008, 25 states and the District of Columbia had enacted Renewable Portfolio Standards (RPSs), and 4 states—Utah, Missouri, Virginia, and Vermont—had non-binding goals, which are voluntary goals for adopting renewable energy as opposed to portfolio standards with binding targets. Figure 3 illustrates the states that have enacted RPSs or goals.

Utah's bill is considered more of a Renewable Portfolio *Goal,* rather than a standard, because it states that renewable energy must comprise 20% of adjusted electricity sales only if such energy is *cost-effective*. Also, there are no interim renewable goals before the enactment of the bill in 2025.[12]

CONCLUSION

Utah enjoys some distinct advantages when compared to the rest of the nation. Utah produces more overall energy than it consumes and is therefore a net exporter of energy products (see Figures 4 and 5). However, in the case of oil, Utah is a net importer.

As a result of these factors, Utah will likely continue to have competitive energy prices compared to the rest of the country, in the short term. In the long run, however, there are several potential threats to Utah's favorable energy market. While prices for most energy sources in Utah will probably remain lower than the rest of the country, they will continue to rise, in absolute terms, due to increasing domestic and global demand, which will be accompanied by an increase in energy consumption in Utah, caused by the rapidly-growing in-state population.

Furthermore, fossil fuels are an inherently diminishing resource. Worldwide oil reserves could start drying up in as soon as 50 years, with coal following 50-100 years behind, and natural gas sometime after that. This could either result in serious consequences for those societies built predominantly on fossil fuels, or in the innovation of new methods for powering the high standard of living that Utahns enjoy. Renewable and nuclear energies are currently the only known sources of energy that are not subject to the same diminishing supplies as fossil fuels. While in the short run they will be more expensive and less efficient to adopt, they remain a consistently-viable source of energy into the distant future.

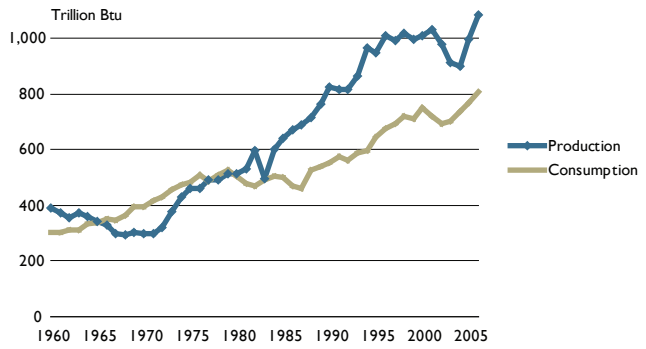
Policy aimed at maintaining a favorable energy situation for Utah, including low prices, good supplies, and environmental sustainability, will consider the long and short term issues related to Utah's energy production and use. A strategic view of energy by policymakers is necessary to ensure that Utah has and maintains the quality of life Utahns expect.

Figure 4: Utah Electricity Generation and Sales, December 2006

	GWh	% of Utah Total
Total Net Electricity Generation	**3,765**	**100.0%**
Petroleum-Fired	4	0.1%
Natural Gas-Fired	472	12.5%
Coal-Fired	3,213	85.3%
Nuclear	—	0.0%
Hydroelectric	56	1.5%
Other Renewables	19	0.5%
Electricity Sales	**2,434**	**100.0%**
Residential	761	31.3%
Commercial	801	32.9%
Industrial	869	35.7%
Transport	3	0.1%

Source: EIA.

Figure 5: Utah Energy Balance, Production and Consumption



Source: Utah Geological Survey.

ENDNOTES

1 Energy Information Administration (EIA). "State Energy Profiles." Available from: http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=UT

2 Yahoo News. "Natural Gas Vehicles Hot in Utah, Where the Fuel is Cheap." Available from: http://news.yahoo.com/s/ap/utah_natural_gas_vehicles;_ylt=AmvMclClU8Dk5gyEXks6ANEDW7oF

3 Since the majority of Utah's coal remains instate for electrical generation, Utah boasts some of the lowest retail electrical prices per kilowatt hour: 6 cents compared to 8.90 cents nationally. EIA. "State Electricity Profiles." Available from: http://www.eia.doe.gov/fuelelectric.html; The remaining 40% of Utah coal is exported primarily to California and Nevada. Utah Geological Society. "Utah's Fossil Fuels." Available from: http://geology.utah.gov/utahgeo/energy/fossil_fuels.htm

4 International Energy Agency. *World Energy Outlook 2007*

5 Nuclear Energy Institute. "State Nuclear Facts." Available from: http://www.nei.org/publicpolicy/stateactivities/statenuclearfacts/

6 Utah does have a nuclear reactor at the University of Utah's Center for Excellence in Nuclear Technology, Engineering and Research. In 2006, coal accounted for 89.6% and natural gas for 8.2% of net generation of electricity. The remaining electricity was generated through hydro or geothermal sources. Utah Geological Survey. Available from: http://geology.utah.gov/sep/energydata/overviewdata.htm

7 Energy Information Administration. Official Energy Statistics from the U.S. Government. "Nuclear Issues Paper." Available from: http://www.eia.doe.gov/cneaf/nuclear/page/nuclearenvissues.html

8 EIA. "Renewable Energy." Available from: http://www.eia.doe.gov/neic/infosheets/renewableenergy.html

9 EIA. "Renewable Energy Resources: A Consumer's Guide." Available from: http://www.eia.doe.gov/neic/brochure/renew05/renewable.html

10 Ibid

11 For more detailed information on the bill visit http://www.swenergy.org/legislative/2008/utah/index.html#SB202

12 Database for State Incentives for Renewables and Efficiency. Available from: http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=UT13R&state=UT&CurrentPageID=1&RE=1&EE=1

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The mission of Utah Foundation is to promote a thriving economy, a well-prepared workforce, and a high quality of life for Utahns by performing thorough, well supported research that helps policymakers, business and community leaders, and citizens better understand complex issues and providing practical, well-reasoned recommendations for policy change.

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