

Renewable Energy Considerations (Part Two) – Common Renewable Energy Sources

Overview

Renewable energy options vary, and their selection should be made based on the specific technology, the geographic location and a number of other factors. Understanding the issues associated with each renewable energy source can determine the steps required for their adoption and implementation as they become a larger portion of our electric supply source.

Each type of renewable energy has distinct benefits and costs. The benefits associated with each energy technology is listed below.

Six Commonly Used Renewable Energy Sources

The most commonly used types of renewable energy are wind, solar, geothermal, hydroelectric, biomass and hydrogen. They can provide substantial climate, health, and economic benefits.

Wind Power: Wind power is typically generated by large-scale wind farms which are located either on land or just off shore where they are connected to power grids that distribute their electricity to end users. Some small consumers of power also employ wind power technology where construction of transmission lines is expensive or prohibited¹. Wind power currently provides 1.9 percent of the energy consumed in the United States (Figure 1). Though wind power has increased substantially since the year 2000, it constitutes only a small fraction of U.S. electricity supply. Wind power can be viable in areas where prevailing conditions are favorable, especially if there are mandated requirements for the production of renewable energy.

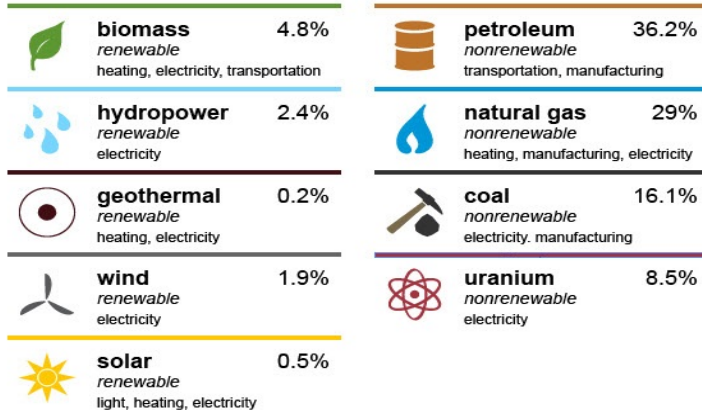
in height between the water’s source and outflow. In 2015, hydropower represented 2.4 percent of the total energy consumed in the United States, lower than the level it reached in 2014⁵ (Figure 2).

Biomass Energy: Biomass is organic material that comes from plants and animals, and it is a renewable source of energy responsible for 4.8% of the energy consumption in the U.S. Historically in the United States it has come from three primary sources: wood, waste, and alcohol fuels. Waste energy consists of municipal solid waste (MSW), manufacturing waste, and landfill gas. Biofuels are another source of biomass energy. Ethanol is the most popular of the alcohol fuels and, together with biodiesel, has received much attention because of growing use stemming from government mandates that require and subsidize its use⁶.

Hydrogen Power: Hydrogen fuel, when produced by renewable sources of energy like wind or solar power, is a renewable fuel. Hydrogen is the simplest and most abundant element in the universe, but does not occur naturally as a gas on the Earth. Hydrogen is typically found in compounds like water⁷ and in many hydrocarbons that make up fuels, such as gasoline, natural gas, methanol, and propane. Hydrogen can be transported to locations where it is needed, similar to electricity. Although hydrogen is considered a secondary renewable source, it potentially could also join electricity as an important energy carrier in the future.

In Figure 2 below, the US Energy Information Administration (EIA) outlook for renewable electricity generation shows projections on the potential development of renewable energy until the year 2040.

Figure 1 U.S. Energy Consumption by Source, 2015²



Sum of individual percentages may not equal 100 because net imports of coal coke and of electricity are not included. Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3, March 2016, preliminary data

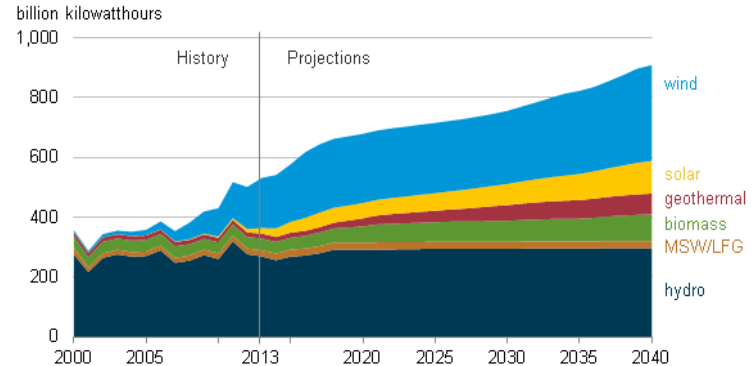
Solar: The amount of utility-scale solar electricity capacity in the US has increased in recent years, and currently accounts for 0.6% of net electricity generated in the United States. Including rooftop solar panels and other non-utility residential, commercial and industrial solar installations, solar power’s share of generation is currently 0.9 percent³.

Geothermal Power: Geothermal power plants do not burn fuel to produce electricity, so their emission levels are very low. High temperature geothermal energy is extracted from in the Earth’s crust and piped to steam turbines to drive generators to produce electricity, hot water or steam. A geothermal plant typically releases less than 1 percent of the carbon dioxide emissions of a fossil fuel plant and about 3 percent of acid rain emissions⁴. Moderate-to-low temperature geothermal resources are used for direct-use applications such as space heating or “district” heating, where a sole source of geothermal energy is used to heat multiple buildings or in some cases, a whole community. Lower-temperature, shallow-ground geothermal resources are used by geothermal heat pumps to heat and cool individual buildings.

Hydroelectric Power: Most hydroelectric power comes from dammed water driving a water turbine coupled to a generator. The amount of energy extracted from the moving water depends on the volume of water and on the difference

Figure 2

Renewable Electricity Generation by Fuel Type in Annual Energy Outlook (AEO) 2015⁸



Part three of this bulletin will present the pros and cons of the most common renewable energy sources, their impact in economics, reducing greenhouse gases and procurement for federal agencies.

References

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