NIH GREEN ZONE NEWSLETTER

The Newsletter of the NIH Environmental Management System

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The Many Sources of Electricity

Since the late 1800s, electricity has grown from a useful commodity to a vital household utility to an everyday necessity. But how do we create electricity? Most electricity in the U.S. is generated at power plants that utilize turbines.[1] The turbines spin electromagnetic shafts that rotate inside coils of copper wire.[1] This process converts mechanical energy into an electrical current that is carried throughout an electrical power grid to all users.[1] There are over 8,500 power plants in the U.S. and they use a variety of methods to move their turbines, generally split into two categories: renewable and non-renewable sources.[2] Non-renewable methods of electricity generation burn fossil fuels (coal, natural gas, petroleum) or utilize nuclear fission to spin turbines. Renewable sources power turbines by harnessing hydropower or wind energy, burning biomass fuels or utilizing geothermal energy. Notably, solar power does not require turbines like most other sources. Solar panels use photovoltaic arrays to convert sunlight into electricity.

Each electricity source has unique benefits and disadvantages. Fossil fuels, like coal, natural gas and petroleum, have been used for decades as the primary source for electrical power generation and have the benefit of pre-existing infrastructure. Fossil fuels accounted for 63.5% of electricity generated in the U.S. in 2018.[3] Fossil fuels are widely available and provide a consistent source of electricity. However, only a finite amount of these resources exist.[4] Additionally, the mining and burning of fossil fuels produces greenhouse gases, like carbon dioxide, which warm the Earth's surface.[5] Nuclear energy does not release air pollution through operation, although there are some emissions associated with the mining and refining processes.[6] Nuclear reactors can produce steady electricity for months; however, radioactive waste is generated as a byproduct of this process and the uranium used to produce the reactor core is a limited resource.[6] Water, wind and solar sources produce no emissions from operation, but may have unintended environmental consequences.[7,8,9] For example, wind turbines create noise pollution and have influenced bird and bat populations, while hydro-electric dams can flood upstream areas and prevent fish migration.[7,8] Additionally, these sources can struggle to produce consistent electricity loads, since they depend on weather conditions. Until renewable electricity sources can solve issues with consistent generation, it is likely they will need to be supplemented with fossil fuels or nuclear energy.

The breakdown of electricity sources varies greatly by region. As mentioned previously, renewable sources can struggle with consistent production, so they are frequently placed in regions where they are best suited. As a result, the highest percentage of hydropower is from the rainy areas of Alaska and the Pacific Northwest.[10] Likewise, the region with the highest percentage of solar electricity is sunny California.[10] A region-by-region breakdown can be found on the EPA Power Profiler website. Another interesting observation is the Maryland, D.C., Virginia and Carolina regions, which are home to many NIH campuses, generate far more than average amounts of electricity from nuclear power.[10] The U.S. Energy Information Administration projects an increase in natural gas and solar production in the next few years.[11]

The NIH fills most of its electricity needs by purchasing from local suppliers, but also utilizes a few methods for directly generating electricity with minimal environmental impacts. Solar panels have been installed on multiple buildings, such as Building 35A on the Bethesda campus and the Net-Zero Energy Warehouse on the Research Triangle Park campus. These photovoltaic arrays help to offset the electricity use of their buildings or, in the case of the Net-Zero Energy Warehouse, completely offset the electricity usage. The Central Utility Plant (CUP) on the Bethesda campus generates electricity through its cogeneration plant. This plant uses fossil fuels to generate electricity, but also captures thermal energy that would otherwise be wasted and uses it to produce steam. The cogeneration plant produces about 40% of the electricity used on the Bethesda campus and operates cleaner than typical fossil fuel power plants. You can read more about the NIH CUP in our June 2018 issue. The NIH will continue to pursue opportunities to provide clean and efficient electricity in the future.

TAKE ACTION

Reduce Electricity Use: The 2019 ORF/ORS Green Team Initiative

The ORF/ORS Green Team has committed to reducing electricity use on the Bethesda campus. Read the full article to discover their 4 tips to reduce our individual electricity use.

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EVENT

The 2019 Federal Environmental Symposium

The 2019 Federal Environmental Symposium will occur on October 30-31 at the Natcher Conference Center on the NIH Bethesda campus. Click below for the full event details.

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NEMS TRAINING

Did you know? The electricity cost for the Bethesda campus in July of 2018 totaled nearly $2,500,000! We can each reduce our individual electricity consumption to chip away at this cost. To learn more about electricity consumption at the NIH, please visit the NEMS Training webpage to view a short (20 minute) NIH environmental awareness training video.