

Energy

Making the electricity needed to run almost everything

Electricity runs much of Montana’s working landscape. It powers the calving shed light bulb, the grain bin blower, the irrigation pump, and the electric vehicle driven by family members visiting from Seattle.

Most electrical power begins at a power plant. Some type of force spins electrical generators that convert that force into electrical energy. Those forces might be coal, oil, or natural gas burned to convert water to steam, flowing water moving a wheel in a hydroelectric dam, or wind turning the blades of a turbine.

Montana currently has five coal-fired



Above: Built in 1915, Ryan Dam is a hydroelectric dam on the Missouri River, 10 miles downstream from Great Falls. PHOTO BY CRAIG & LIZ LARCOM

Left: Electrical meters on houses and barns measure the amount of electricity used each month, in kilowatt-hours, so utility companies can bill for the energy use. The cost of running any electrical device can be calculated by multiplying its power consumption in kilowatts by the operating time in hours by the price per kilowatt-hour. SHUTTERSTOCK



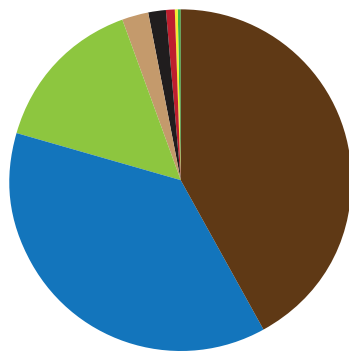
A “kilowatt-hour” (kWh) is a measure of electricity defined as 1 kilowatt (1,000 watts) of power expended for 1 hour. “Watts” are the measure of power that an electrical item like a light bulb uses. “Voltage” measures the power coming through power lines.

plants, eight natural gas- and oil-fired plants, one biomass-powered plant, 23 hydropower plants, more than 1,000 wind turbines, and a scattering of small solar stations. The state exports about one-half of the electricity generated by its power plants over high-voltage transmission lines to other western states.

The size of the power lines, power poles, towers, substations, and other infrastructure—known as the power grid—indicates how much electricity the lines are capable of carrying. The high-voltage lines coming from the plant run several hundred feet off the ground, carried by monstrous steel towers that appear to march across the landscape. As it nears energy customers, high-voltage power gets “stepped down” in stages so it can be distributed to and used by businesses and homes. This is usually done at smaller substations, often seen along highways, paved in gravel and ringed with wire fencing.

It’s similar to how water starts in a massive reservoir or river and then flows into increasingly smaller pipes until it comes out

Montana Electricity Generation



Coal	41.95%
Hydro	37.73%
Wind	14.78%
Natural gas	2.46%
Oil	1.70%
Other fossil fuels	1.00%
Solar	0.31%
Biomass	0.04%

SOURCE: 2022, U.S. ENERGY INFORMATION ADMINISTRATION



your tap to fill a glass.

Where a power line reaches a house or other building is a transformer drum attached to a pole. The transformer’s job is to reduce the 7,200 volts in the line down to the 240 volts that make up normal household electrical service so people can use both heavy-duty 240-volt appliances (like electric dryers and water heaters) and 120-volt appliances (most everything else).

ENERGY SOURCES

For decades, hydroelectricity was the state’s most significant energy source. But starting in the 1980s with completion of the Colstrip Power Plant, coal became the top energy producer. Most extraction occurs in large, private surface mines in the Powder River Basin south and east of Billings on federal land leases. Some also comes from the Crow Reservation and private land.

Roughly 75 percent of the coal mined in Montana is shipped by rail to power plants in Washington and Oregon and overseas to Japan and South Korea. The rest is burned to generate electricity in Montana power plants and currently accounts for 42 percent of the state’s power supply.

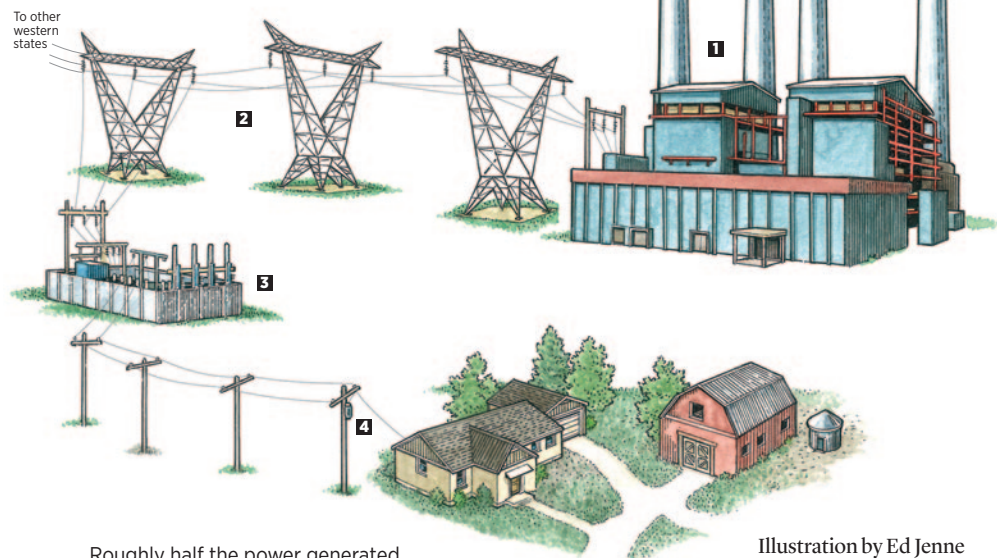
Despite declines in coal prices and tax rates since the highs of the 1980s, taxes on coal are still a major source of revenue for economic development, drinking water, schools, and other state programs. A major concern for Montana coal producers and state budget officials is that Washington and Oregon are increasingly switching to renewable energy sources.

The second-biggest energy source, accounting for 38 percent of Montana’s in-state net generation, is hydropower. Most hydropower plants are in the western half of the state, though Yellowtail Dam on the Bighorn River and Fort Peck Dam on the Missouri River are two of the biggest.

Natural gas is also burned to generate electricity from turbines. Montana ranks 20th among the 50 states in natural gas production, with over 6,000 active wells. Most are in the north-central and far northeastern parts of the state. Natural gas production has increased over the past decade as U.S. drillers unlocked vast reserves from shale

Power transmission

Power plants **1** burn fossil fuels or use hydropower to rotate turbines that create electricity. Wind turbines and solar cells also produce electricity. High-voltage electricity is carried in heavy power lines **2** held up by massive towers.



Roughly half the power generated in Montana is sold to other western states. The rest is used here. The high-voltage electricity is continually “stepped down” at substations **3** scattered across the state so it can be used at farms, homes, and businesses. Once it reaches a building, the electricity goes into a transformer drum **4** to reduce the voltage even further so it can power 240- and 120-volt appliances.

Illustration by Ed Jenne



Above: The Colstrip Power Plant, 80 miles east of Billings. Though the plant burns low-sulfur coal and employs state-of-the-art scrubbers to restrict sulfur dioxide emissions to less than levels required by the Clean Air Act, concerns about carbon dioxide and global warming have caused Oregon, a major customer, to scale back purchases of electricity generated by the facility. Below: Montana’s four oil refineries, including this one of two in Billings, refine crude oil mainly from Canada and Wyoming into gasoline, ultra-low-sulfur diesel fuels, aviation fuels, butane, and propane.



CLOCKWISE TOP-LEFT: SHUTTERSTOCK; CHRIS BOYER/KESTREL; AERIAL IMAGES; TODD KLASSY



A herd of cattle provides scale to enormous wind turbines, standing 262 feet high, in the Judith Gap Wind Energy Center in central Montana. Below, hydroelectric generators in the powerhouse at Ryan Dam on the Missouri River at Great Falls create energy from the power of water flowing from the upstream impoundment. The five hydropower facilities in and near Great Falls earned it the nickname Electric City.

rock by the use of hydraulic fracking. Fracking involves injecting water under high pressure into underground bedrock to open up gaps that allow gas and oil to flow more freely, unlocking reserves previously inaccessible to drilling companies.

Montana's roughly 5,000 active oil wells, most in the Bakken Formation of northeastern Montana, put the state 12th nationally in oil production.

Montana has four petroleum refineries, two in Billings, one in Laurel, and one in Great Falls. The refineries receive crude oil mainly from Canada and Wyoming and produce a wide range of refined products, including gasoline, ultra-low-sulfur diesel fuel, aviation fuel, butane, and propane.

Wind power ranks third in Montana electricity generation and is growing rapidly. Montana has more than 1,000 commercial wind turbines, concentrated mainly along the Rocky Mountain Front, central Montana, and north of Miles City (location of the state's largest wind farm, Clearwater Wind Energy Center).

The wind turbines' 250- to 300-foot towers and their 100- to 150-foot blades can be seen from miles away. 🐾



FROM TOP: CRAIG & LIZ LARCOM, TODD KLASSY



FWP and energy



FWP biologists regularly work with Northwestern Energy staff to find ways to reduce the electrocution of ospreys and other raptors by power lines. Among the solutions are perching deterrents as well as nesting platforms installed away from power poles and towers so the birds aren't tempted to nest near the dangerous lines.

Biologists also advise Northwestern and other wind energy developers on locating and operating wind turbines in ways that do the least harm to bald eagles, bats, and other flying wildlife killed by the spinning blades.

With hydropower, FWP fisheries biologists consult with dam operators to find ways to increase flows in spring to flush silt out of trout spawning gravel, and in late summer when rivers drop and rising water temperatures imperil coldwater fish.

FWP wildlife biologists also raise concerns that roads, power lines, and other infrastructure built in grasslands by coal, gas, and oil companies fragment habitat essential for sage-grouse and other ground-nesting birds, disrupt ancient migration routes used by pronghorn and mule deer, and, in the case of power poles, give golden eagles perching areas from which they can prey on sage-grouse.



Blankenship volunteer fire department in northwestern Montana.

Volunteer fire departments

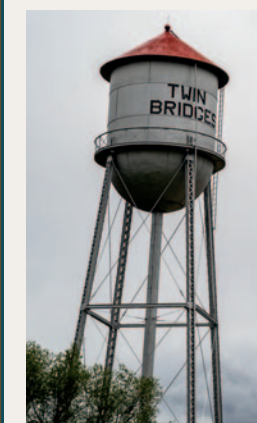
One of the most important structures in any rural community is the volunteer fire department and emergency services building, usually found on the outskirts of town. No one is in the building until volunteers, working their day jobs or at home at night, are paged and arrive to suit up and head out to an emergency.

More than 350 such departments are spread across rural Montana. The county or town buys the engine or ambulance, but community members donate their time and service.

Many volunteers are trained as "community first responders," with specialized medical skills to assist before an ambulance arrives and in hazardous materials operations, traffic incident management, and wildfire assessment. Volunteer fire crews also respond to vehicle accidents, natural disasters, hazardous material spills, and water rescues.



Three Forks volunteer firefighters respond to a vehicle fire.



Water towers

Town water towers are another feature visible from miles away. Most are made of steel and concrete, stand 130 to 165 feet tall, and store potable water. The towers are built on high ground to provide enough pressure to supply all the customers in the area.

The water originates in reservoirs, rivers, or wells and is piped to a treatment plant to remove sediments, microorganisms, and other pollutants before being pumped up into the water tower.



Grasshopper pumps

Also known as jack or donkey pumps, these devices extract crude oil from relatively shallow wells where there's not enough pressure to drive the fossil fuel to the surface.

An electric or fuel-powered motor turns a crank arm that lifts and lowers the "donkey head," which is connected to underground rods, valves, and pistons that pump 1 to 10 gallons of oil per stroke. Grasshopper pumps are found mainly from Great Falls north to the Canada border, in far eastern Montana, and along the Wyoming border. Immobile pumps usually signal wells that have run dry.