How we make your *ELECTRICITY*

From our power plants to your home

IDAHO POWER®
An IDACORP Company

Since it first was harnessed for practical use, the demand for electricity has increased almost daily. Today, even though we put such reliance in it, electricity production and distribution generally are not understood by the majority of people who use it.

ELECTRICITY IS *PURE ENERGY*

Electricity is pure energy that's sent to your home safely and efficiently. You never hear it, see it, smell it, or touch it, but when you need it, all you have to do is flip a switch, push a button or plug in a cord.

Electricity is energy converted from natural resources or fossil fuels, and it can be generated by many different types of power plants.

The equipment that makes electricity is often very complex, but the theory behind electricity is quite simple. Electricity is made by spinning a magnet inside a coil of wire. This is called a generator. It's connected to a power source, which turns a shaft that's connected to the generator. This power source can be one of many types of prime movers including hydro turbines, wind turbines, steam or natural gas turbines.

Idaho Power's hydroelectric system on the Snake River uses falling water to spin the turbine blades. The turbine looks much like a large ship propeller. Falling water has tremendous power and is the most inexpensive method of generating electricity.

Idaho Power also manufactures power at natural gas and coal-fired generating facilities. At coal plants, coal is burned to turn water into steam that is directed against steam turbine blades. Idaho Power is a part owner in three coal-fired plants. Idaho Power also owns two gas turbine plants. In gas turbines, natural gas is burnt and the hot gasses produced are directed at turbine blades. This process is like a turbo-prop aircraft engine, but in generation applications, the turbine turns the generator, rather than a propeller.

Nuclear plants work in much the same principle as coal plants, except they use the heat of nuclear fission, rather than coal, to make steam. Idaho Power does not operate any nuclear power plants.

Distribution
TO YOUR HOME

Idaho Power's service area covers more than 24,000 square miles in southern Idaho and eastern Oregon. To get electricity from our power plants to the homes of its customers, the company has constructed thousands of miles of transmission and distribution lines. The electricity that lights a home in Twin Falls, for example, could have been produced at our Hells Canyon Dam. The electricity that powers an irrigation pump near Caldwell might well have been generated at the Valmy coal-fired plant in northern Nevada.

This is how it works:

The electricity produced at each of the generating plants is channeled from the generators to a transformer. The transformer "steps up" or increases the voltage to 230,000 volts. This is done so that power can be transmitted over large distances. The longer the distance electricity has to travel, the higher the voltage must be.

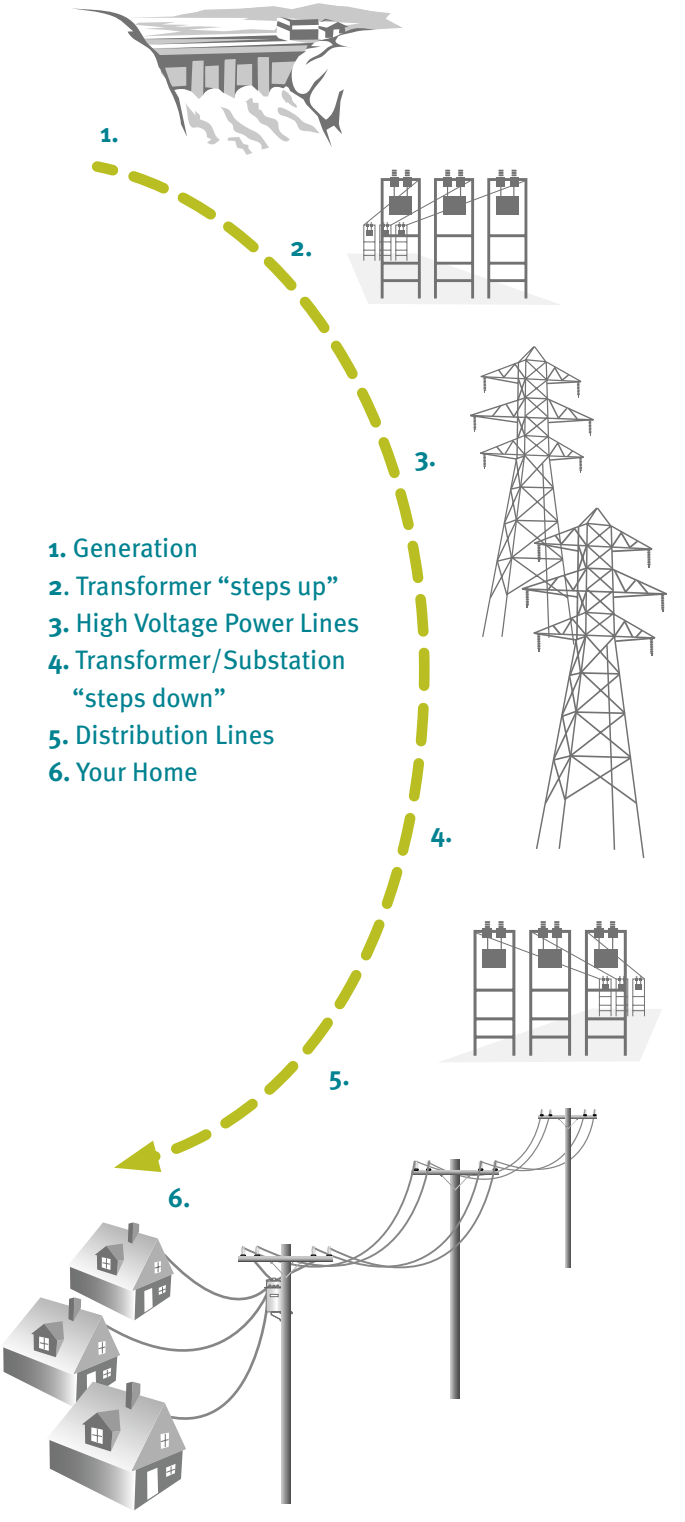
High voltage power lines carry electricity from the power plants to points throughout the Idaho Power system. Customers, however, can't use electricity directly from these high voltage lines because homes and businesses are not set up to handle hundreds of thousands of volts.

Instead, the high voltage electricity flows into transformers at substations where the voltage is "stepped down" to levels that in some cases can be used by industrial customers but is still too high for residential use.

Smaller distribution lines bring electricity to homes and businesses. Transformers, frequently at the top of power poles, lower the voltage again to 120-240 volts before it enters a home.

The explanation of this process takes much longer than the process itself. Since electricity travels at the speed of light (186,000 miles per second), it takes only a fraction of a second.

A customer in Pocatello can operate a vacuum cleaner on electricity produced less than a second earlier hundreds of miles away in Hells Canyon.



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Hydroelectric *GENERATION*

Idaho Power has 17 hydroelectric generating plants along the Snake River and its tributaries. The plants vary in size and production capacity. The largest plants, and the ones that produce the most electricity, are located in Hells Canyon, along the border of Idaho and Oregon.

There are three plants in Hells Canyon - Brownlee, Oxbow and Hells Canyon.

The Hells Canyon Dam is located the farthest downstream and is a good model to show how electricity is produced at hydroelectric facilities.

This is how it works:

Hells Canyon Dam is a concrete structure 330 feet high. The dam extends almost 1,000 feet across Hells Canyon, which is North America's deepest gorge. Its powerhouse (1), located on the downstream toe of the dam, contains three generating units (2) with a maximum production capacity of 450,000 kilowatts (enough electricity for about 270,000 houses, if all the machines operated at full capacity all the time. In times of low water there is not enough water to run all three machines at capacity all the time.)

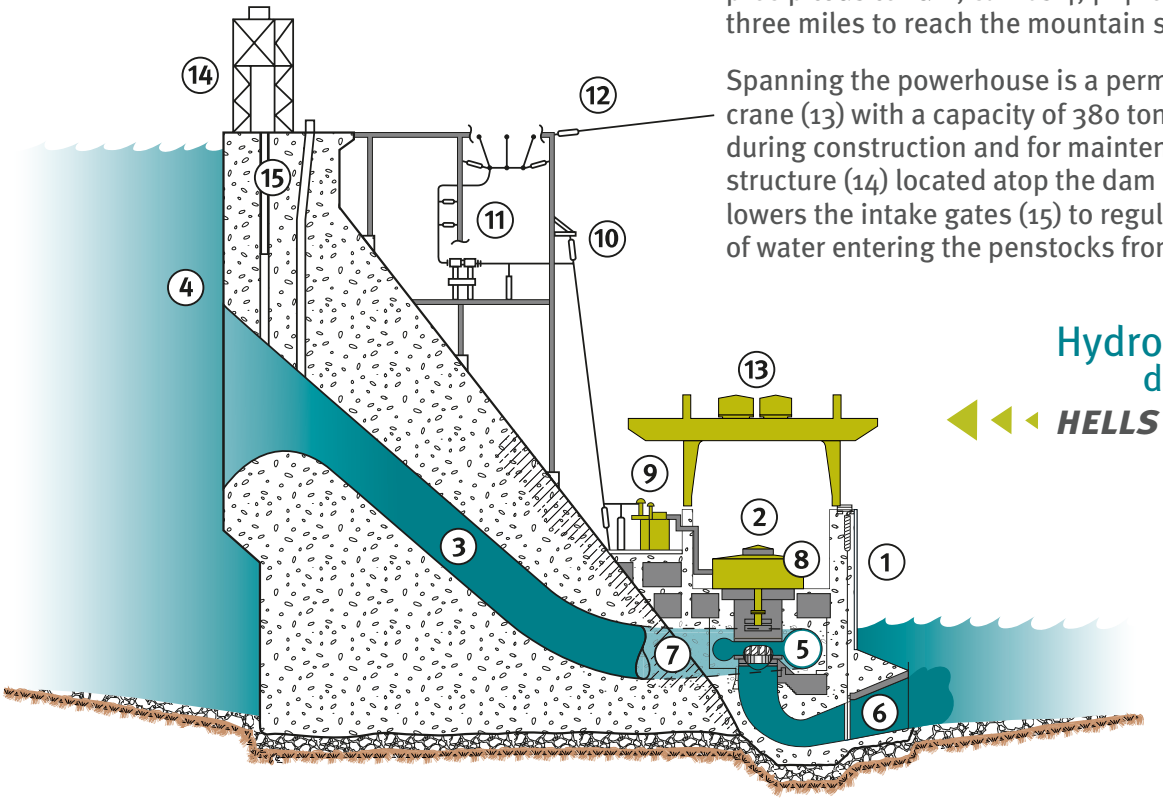
Three steel tubes, called penstocks (3), each 24 feet in diameter, carry water from the reservoir (4) through the dam to the powerhouse. There the water strikes and rotates the wheels of three vertical turbines (5) before dropping into draft tubes (6) and returning to the river downstream.

As the turbines rotate, they turn vertical connecting shafts (7) that simultaneously spin the magnets within the generators (8) to produce electricity.

The electricity flows first to three transformers (9) behind the generator deck, where it is stepped up to 230,000 volts for efficient transmission over long distances. Volts are a measure of electricity's force. Raising voltage makes it easier to send electricity a long way. The electricity moves to the switchyard (10) on the face of the dam — an unconventional location that was necessary because of the lack of any other readily available space in the narrow canyon.

In the switchyard, the electricity flows through circuit breakers (11) and into a double-circuit transmission line (12) linking Hells Canyon with the Idaho Power system. The heavy-duty line, consisting in part of 30 steel towers erected entirely by helicopter airlift because of the precipitous terrain, climbs 4,424 feet in its first three miles to reach the mountain summit.

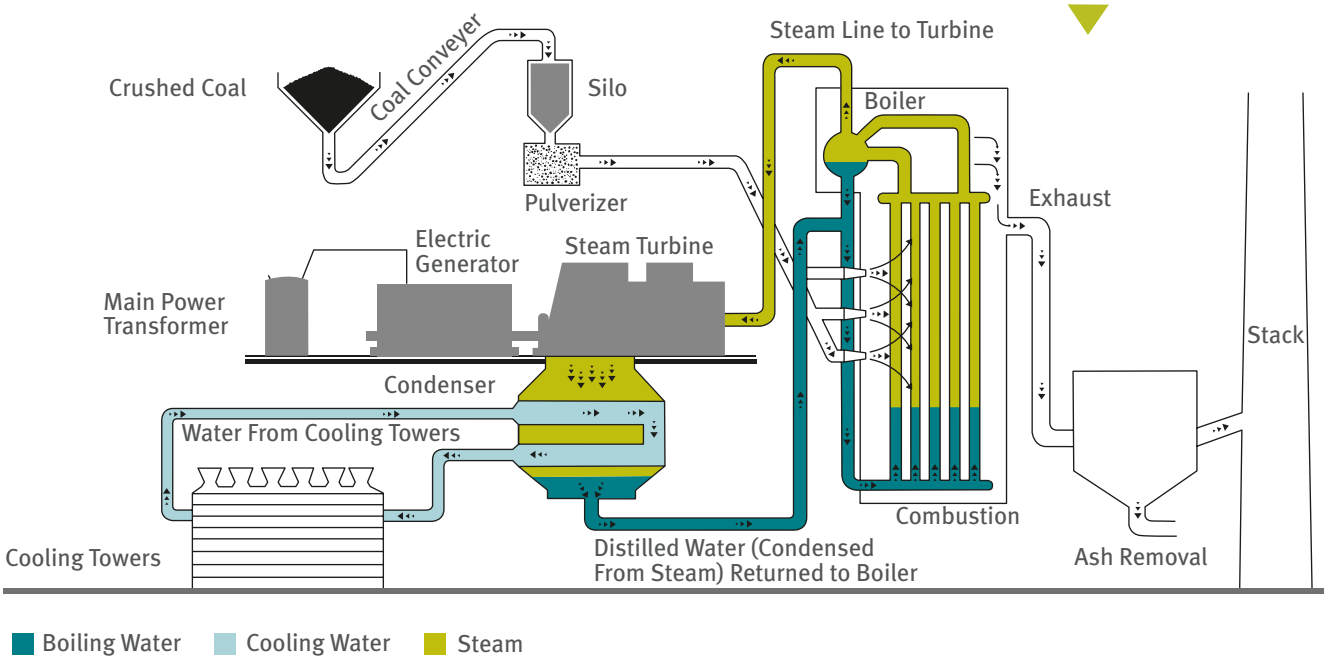
Spanning the powerhouse is a permanent gantry crane (13) with a capacity of 380 tons used during construction and for maintenance. A hoist structure (14) located atop the dam raises and lowers the intake gates (15) to regulate the amount of water entering the penstocks from the reservoir.



Hydroelectric development

HELLS CANYON

Gas & Coal-Fired power plant



Steamelectric *GENERATION*

Although Idaho Power's hydroelectric plants supply more than two-thirds of the company's production most years, there sometimes are low water years when the hydroelectric output decreases dramatically. During those years, the company relies heavily on natural gas and coal-fired generating plants. The company owns the Danskin and the Bennett Mountain natural gas-fired plants 40 miles east of Boise. Idaho Power also owns one-third of the Jim Bridger plant in southwestern Wyoming, one-half of the Valmy plant in northern Nevada and 10 percent of the Boardman plant in eastern Oregon.

At coal-fired plants, heat from burning coal turns water to steam. The steam drives a turbine, which is attached to a generator.

This is how it works:

Coal from the stockpile moves on a conveyor to a silo. As the coal is needed, it drops into a pulverizer where it's ground into a fine powder that's blown into a huge furnace called a boiler. Inside the boiler the coal is ignited creating a fireball reaching temperatures of more than 2,500 degrees Fahrenheit.

Water is pumped into pipes lining the boiler walls, where it's exposed to the tremendous heat of the fireball and becomes steam.

The pressurized steam heats to more than 1,000 degrees Fahrenheit. It's then collected and, with a force of thousands of pounds per square inch, it shoots into the high-pressure section of the turbine. This high-pressure, high-temperature steam hits the turbine blades, causing the turbine shaft to spin. The turning turbine shaft connects with the generator, which produces electricity.

Once the steam passes through the turbine, it goes through a heat exchanger, or condenser. Water in pipes coming from the cooling tower and from lakes and streams outside the plants turns the steam back into water and the cycle begins again.

Explained simply, gas-fired plants are based on aircraft jet engine technology. Like coal-fired plants, the natural gas fuel is burned. But instead of steam, the hot compressed air is sent through a turbine to generate electricity.