photo by Gina Baltrusch

Sustainability

Hydroelectric power is clean, reliable, efficient, flexible and renewable

2nd in a four-part series

story by Bruce Henrickson

In the Pacific Northwest, the U.S. Army Corps of Engineers (Corps) produces significant hydroelectric power for the nation at its dams on the Columbia and Snake rivers.

Hydroelectric power is clean, reliable, efficient, flexible, renewable and sustainable. The Corps is the Nation's largest producer of hydropower, and one of the largest in the world.

The Corps operates 75 hydropower facilities, producing one-fourth of the Nation's hydropower. That's a 100 billion kilowatt-hours annually, enough to power more than 10 million homes.

Hydropower is a sustainable power source. It's part of the Corps' and Nation's "Going Green" effort. It can be used now, and in the future, in an environmentally friendly way. Hydropower is people and nature co-existing in productive harmony.

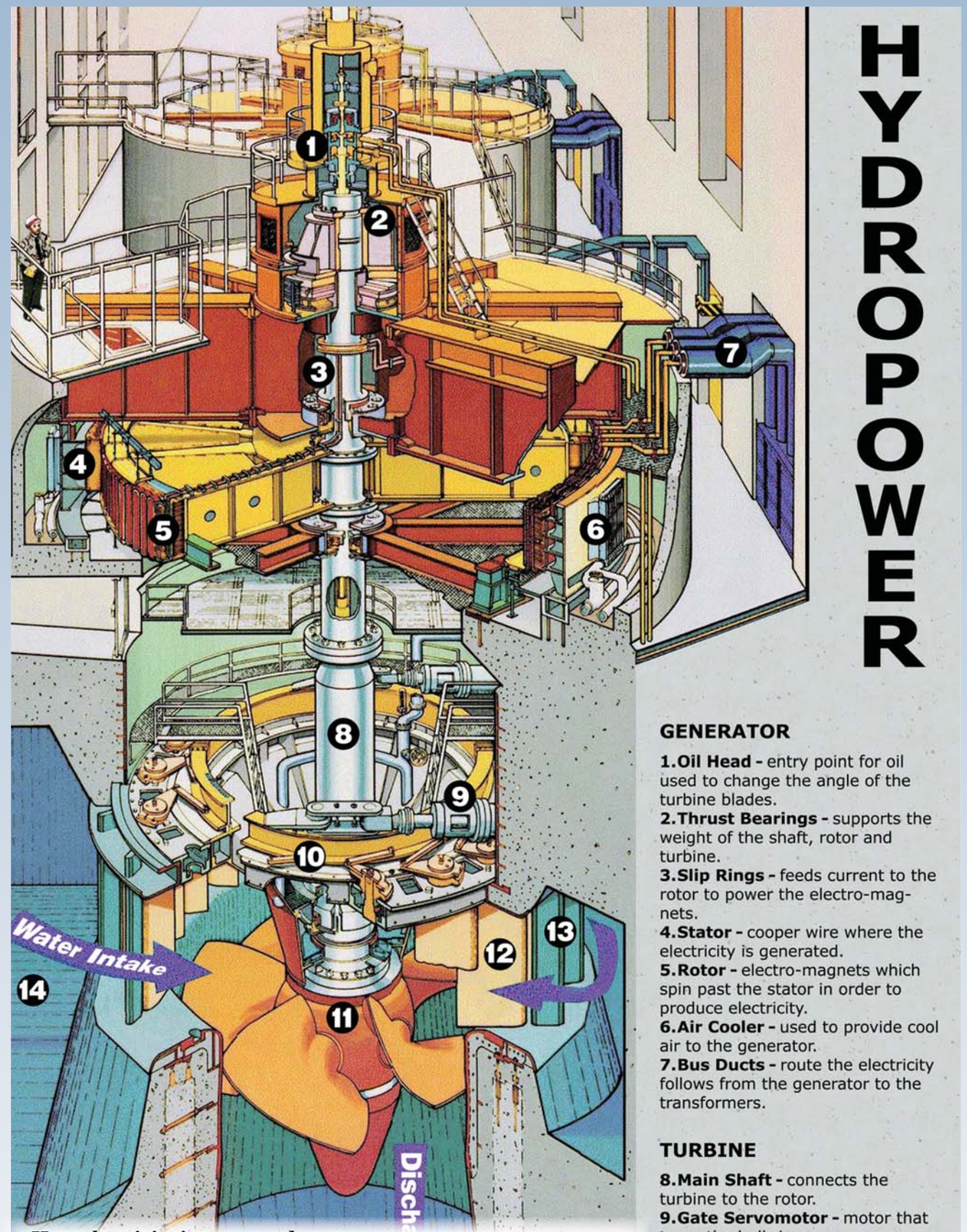
Water flowing through one generator creates more power at downriver dams, again and again. Once that water gets to the ocean, it evaporates and recycles itself as clouds, then rain or snow falling in watersheds, where it generates even more power.

As it produces sustainable hydroelectric energy, the Corps is also a good environmental steward, helping increase and recover populations of migrating endangered or threatened fish species by reducing risks of powerhouses to migrating fish. Initially, Corps dams on the Columbia and Snake rivers were constructed with fish ladders to help adult salmon and steelhead swim upstream.

More recent cutting-edge Corps fish research led to innovative fish bypass systems at the dams to help juvenile fish survive as they migrate downstream. They include spillway weirs, surface bypass channels, turbine screens, modified spill operations, and barge transportation of migrating juvenile fish. Annual fish returns to their spawning grounds have increased significantly in recent years. Corps fish recovery efforts are working.

Every Earth Day, remember hydropower is essential to our nation's success, and to its sustainable future.

The U.S. Army Corps of Engineers strives to protect, sustain, and improve the natural and human-made environment of our nation, and is committed to compliance with applicable environmental and energy statutes, regulations, and Executive Orders. Sustainability is not only part of the Corps' decision processes, but is also part of its culture.



GENERATOR

1.Oil Head - entry point for oil used to change the angle of the turbine blades.
2.Thrust Bearings - supports the weight of the shaft, rotor and turbine.
3.Slip Rings - feeds current to the rotor to power the electro-magnets.
4.Stator - cooper wire where the electricity is generated.
5.Rotor - electro-magnets which spin past the stator in order to produce electricity.
6.Air Cooler - used to provide cool air to the generator.
7.Bus Ducts - route the electricity follows from the generator to the transformers.

TURBINE

8.Main Shaft - connects the turbine to the rotor.
9.Gate Servomotor - motor that turns the bull ring.
10.Bull Ring Mechanism - opens and closes the wicket gates.
11.Kaplan Turbine - converts energy of falling water into a spinning motion.
12.Wicket Gates - used to control water flow to the turbine blades.
13.Stay Vane Ring - guides water into the wicket gates.
14.Scroll Case - guides water to the wicket gates.

How electricity is generated

Water flowing downstream at dams produces electricity. As the water passes through the dam's powerhouse, it falls from the upstream level behind the dam to a lower downstream level. The water is moving with tremendous force and is guided down to the turbine. As it strikes the turbine blades, the water turns the turbine like a propeller. The turning turbine spins coils of wires inside a large generator mounted above it, converting the mechanical energy of falling water into electrical energy. Transmission lines then carry the electricity to homes and businesses.