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HYDROPOWER

BACKGROUND BRIEF

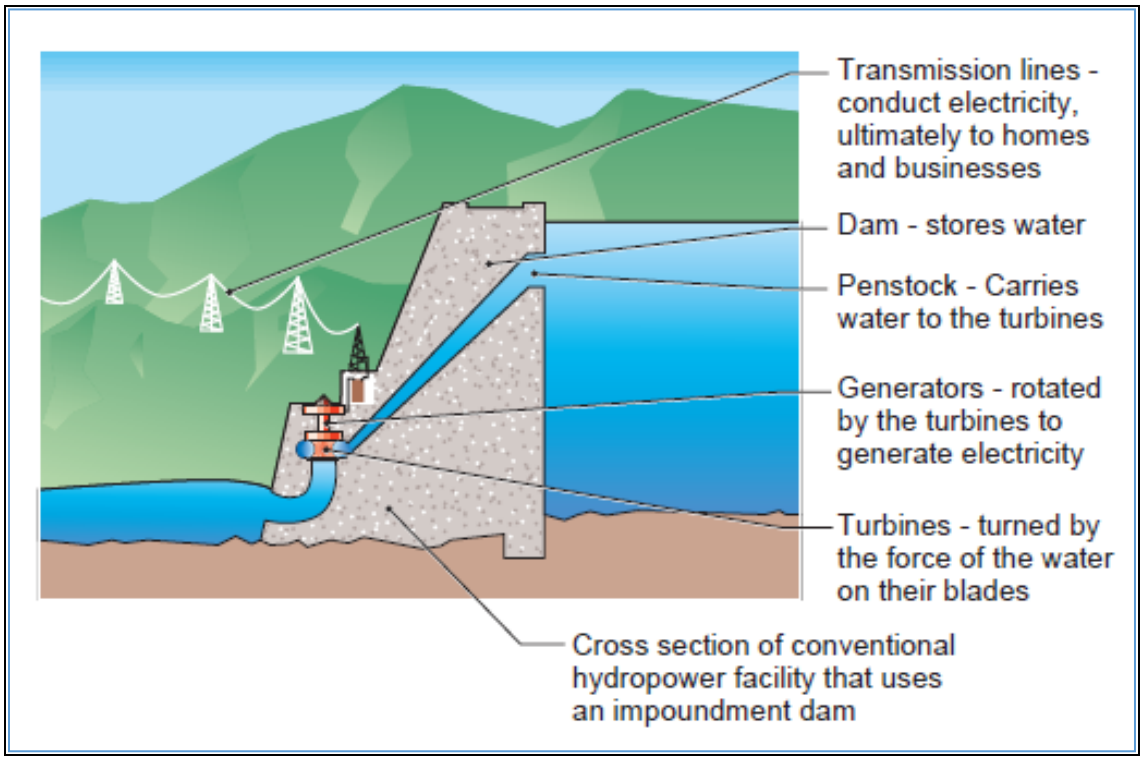

Figure 1: Impoundment Hydropower Facility Figure published by the U.S. Department of Energy

Hydropower, or hydroelectric power, uses the energy of flowing and falling water to create electricity. A typical hydropower system passes water through turbines connected to generators that create electricity as they rotate (Figure 1). The amount of energy that can be produced depends upon water flow, volume and pressure.

TYPES OF DEVELOPMENTS

There are several types of hydropower facilities including: impoundment, diversion, pumped storage and conduit. *Impoundments* block river flow and selectively release water stored in the reservoir. They are the most common type of hydropower plant. *Diversion* facilities have an intake that withdraws water from the river without a reservoir. *Pumped storage* facilities move water between two reservoirs by releasing water from an upper reservoir to a lower reservoir to generate electricity during periods of high power demand. During low demand, the water is pumped from the lower reservoir back to the upper reservoir. Finally, *conduit* projects usually incorporate small

turbines into existing infrastructure such as tunnels, pipelines and canals to generate electricity from flowing water.

Since conduit projects can avoid the impacts to natural resources associated with other kinds of hydro projects, many new technologies focus on conduit designed for irrigation canals, municipal pipes and other types of artificial water conveyance structures. Examples in Oregon of hydropower innovation include Natel Energy's project for North Unit Irrigation District at a Bureau of Reclamation facility near Madras and Lucid Energy's installation in the City of Portland's municipal water pipes.

The Oregon Integrated Water Resources Strategy (2012) directs the state to "take advantage of existing infrastructure to develop hydroelectric power" (recommended action 4.b).

HYDRO ENERGY STORAGE

An affordable, grid-scale option for energy storage is *pumped storage*, which stores energy by pumping water uphill during times of low electricity demand. When demand for electricity is high, the stored water can be released to flow downhill and generate electricity. Pumped storage downsides include a relatively high cost per megawatt (**MW**) and potential incompatibility with restrictions on Columbia River Basin hydropower operations, including flow requirements and fish protections.

There are no pumped water storage projects in Oregon, but at least four projects have been considered. A preliminary permit was issued for a proposed project at Swan Lake in late 2015; this facility would store about 400 MW of electricity.

OREGON AND HYDROPOWER

Oregon was the second highest hydropower producing state in 2014 according to the U.S. Energy Information Administration. Analysis from the Oregon Department of Energy shows that Oregon received nearly 43 percent of its electricity from hydropower from 2012-2014. As shown in Figure 2, most large scale hydropower projects in Oregon are within the Columbia and Willamette River drainages.

Figure 2: Top electricity generating hydropower projects in Oregon. Figure generated from Northwest Power and Conservation Council website http://www.nwcouncil.org/energy/powersupply/map/

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