Hydropower

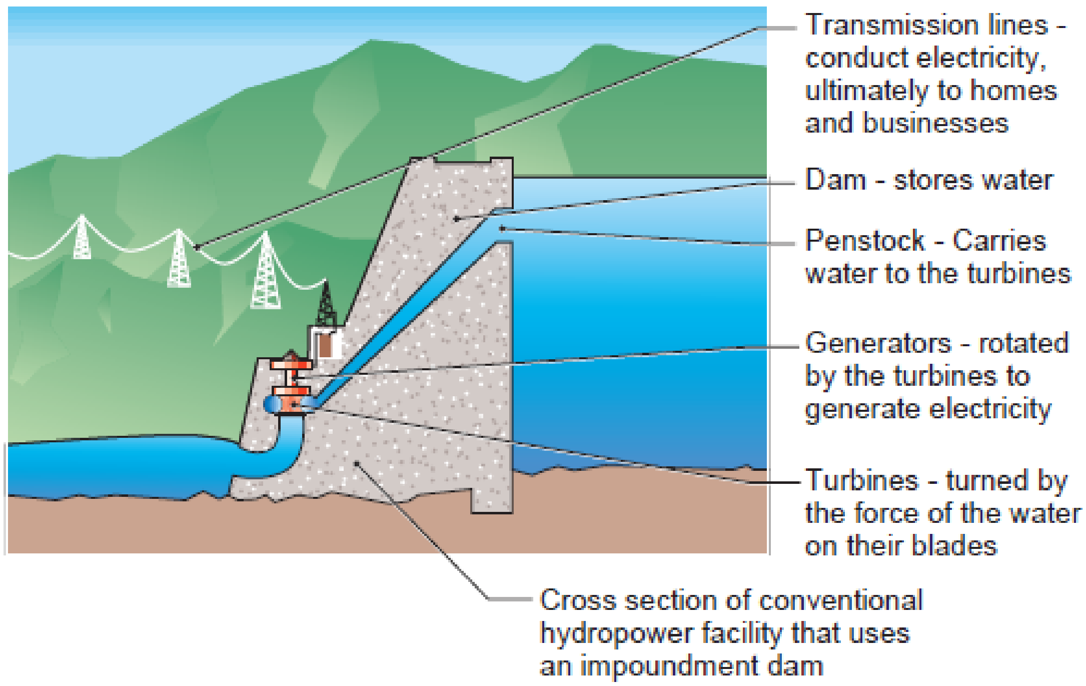

Figure 1 Impoundment Hydropower Facility Figure published by U.S. Department of Energy

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. The amount of energy that can be produced depends upon water flow, volume, and head. "Head" refers to water pressure, which is derived from the vertical distance the water drops and the characteristics of the pipe or channel. As volume or head increases, there is more potential to generate power. Increasing the amount of head reduces the amount of water needed to produce a certain quantity of power. Turbines are designed to maximize efficiency for either low head/high flow facilities, or high head/lower flow facilities.

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 its 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.

New technology designs for hydropower focus on this last category of conduit projects, designed for irrigation canals, municipal pipes, and other types of artificial water conveyance structures in order to avoid natural resource impacts. Recent examples in Oregon of hydropower innovation include Natel Energy's project for North Unit Irrigation District at a Bureau of Reclamation facility near Madras (see http://www.natelenergy.com) and Lucid Energy's installation in the City of Portland's municipal water pipes (see http://www.lucidenergy.com/).

The statewide Integrated Water Resources Strategy (2012) directs the state to "take advantage of existing infrastructure to develop hydroelectric power" (recommended action 4.b). http://www.oregon.gov/owrd/pages/law/integrated_water_supply_strategy.aspx

Oregon was the second highest hydropower producing state in 2013 according to the U.S. Energy Information Administration. Analysis from the Oregon Department of Energy shows that Oregon received 45 percent of its electricity from hydropower from 2010-2012. As shown in Figure 2, most large scale hydropower projects in Oregon are within the Columbia and Willamette River drainages.

Oregon and Hydropower

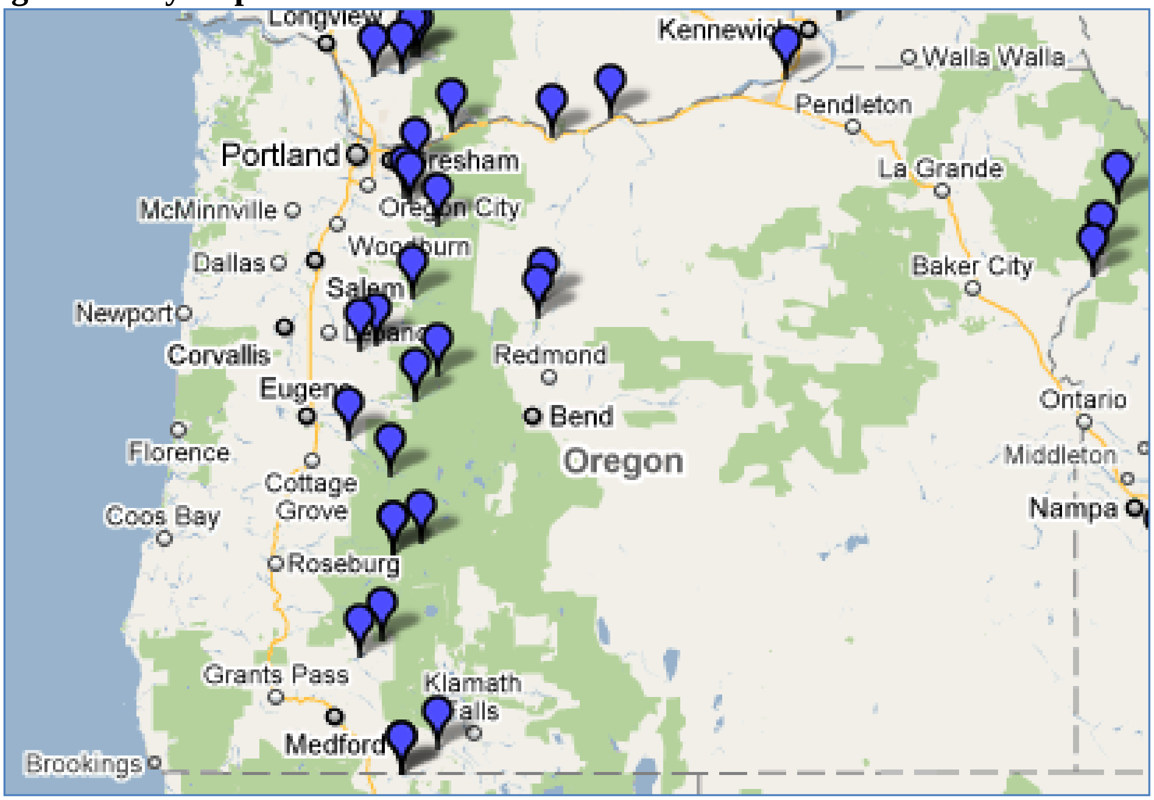

Figure 2 Top electricity generating hydropower projects in Oregon. Figure generated from Northwest Power and Conservation Council Website http://www.nwcouncil.org/maps/power/Default.asp

Protected Areas

In 1988, the Northwest Power and Conservation Council (Council) designated "protected areas" in its Columbia River Basin Fish and Wildlife Plan (Plan).[1] Protected areas are stream reaches where the Council believes new hydroelectric development would have unacceptable risks of loss to fish and wildlife species of concern, their productive capacity, or their habitat. The Plan directs Bonneville Power Administration not to purchase power from new hydropower development located in protected areas. The Plan also asks the Federal Energy Regulatory Commission and other federal agencies to consider protected areas when issuing permits, exemptions, and licenses. The Plan was last updated in 2009 and the Council is currently in the process of amending the plan.

[1] http://www.nwcouncil.org/fw/protectedareas/

Low Impact Hydropower Institute

The Low Impact Hydropower Institute (www.lowimpacthydro.org) offers a third-party certification for hydropower facilities that voluntarily comply with low-impact standards. To receive a certification, a facility is reviewed under several criteria, including threatened fish and wildlife, recreation, cultural resources, water quality, and river flows.

Status	FERC License Number	Certificate Number	Capacity Rating (MW)	Project, River (Owner)	Nearest Community/ Feature
Certified	P-7532 & P-6801	45	4.8	Farmers Irrigation District Project (Farmers ID)	Hood River
Certified	P-2030	25	366.8	Pelton Round Butte Project, Deschutes R (PGE)	Madras
Certified	P-2233	33	16.7	Willamette Falls, Willamette R (PGE)	Oregon City
Certified	P-6661	4	4.1	Falls Creek (Falls Creek Ltd Partnership)	Sweet Home
Certified	P-1927	69	188.7	North Umpqua Project (PacifiCorp)	Roseburg
Certified	P-3571	73	5.5	Siphon Project, Deschutes R diversion (Central Oregon ID)	Bend
Certified	P-11509	84	0.5	Vine Street Hydro Project, S. Santiam R (City of Albany)	Albany
Certified	P-7076	71	4.9	North Shore Dalles Dam Fishway, Washington, Columbia R (N Wasco PUD)	Dalles Dam
Certified	P-2337	109	7.2	Prospect No. 3, Rogue R (PacifiCorp)	Grants Pass

Table 1: Many facilities in Oregon have the LIHI certification