Bonneville Dam's Contribution to the War Effort

by William F. Willingham

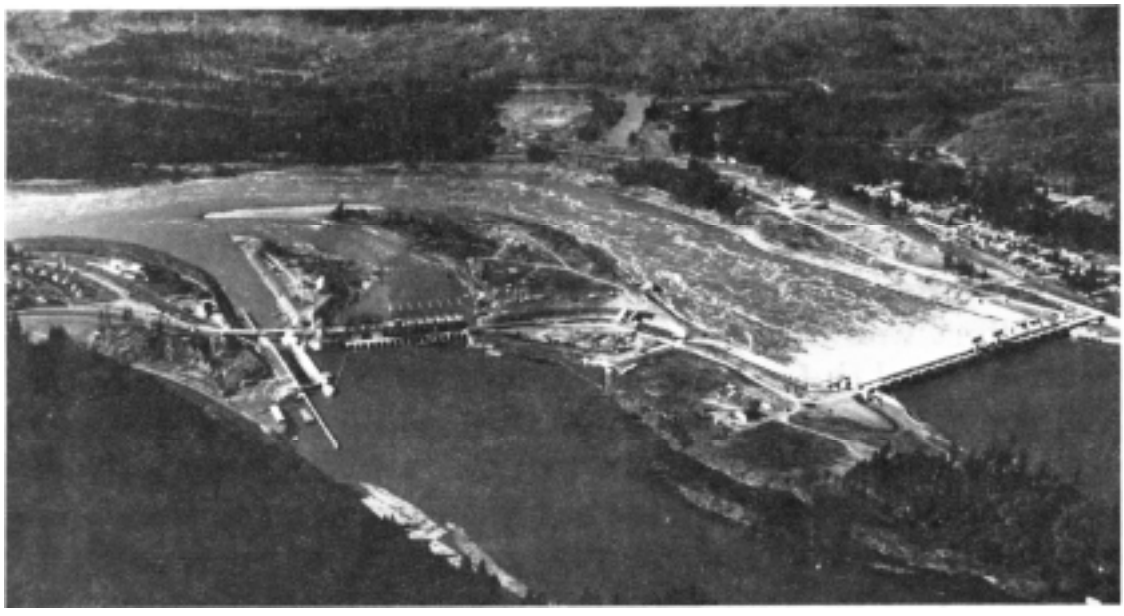
When the United States declared war on Japan on 8 December 1941, the need for massive amounts of electrical power to fuel the domestic war effort became immediately evident. Bonneville Dam, which began generating power in May 1938, contributed mightily to this need. Electric power from Bonneville Dam's power plant was delivered by the Bonneville Power Administration (BPA) to public and private customers throughout the Pacific Northwest. During World War II, BPA supplied power to shipyards at Portland, Oregon, and on the Puget Sound in Washington, to aluminum plants scattered throughout the region, and to airplane factories near Seattle.

When work began on Bonneville Dam in September 1933, no one foresaw the need for the huge amount of power the war effort would require. At the time of construction, some even doubted the energy generated by the initial two Bonneville power units (87,000 kilowatts) would ever be fully utilized. Commentary published in the regional and national press expressed the belief that for the forseeable future little market existed for the federal power from Bonneville. As the dam neared completion, the eastern press assailed it as the "Dam of Doubt."

In the midst of the controversy over whether hydropower dams on the Columbia River were needed, another point of contention arose over who would market the electricity produced. To resolve the marketing issue, Congress, in 1937, created BPA to sell and distribute the power generated by the Corps of Engineers at Bonneville Dam. Although originally conceived as an interim measure until Congress could legislate a Columbia Valley Authority patterned after the Tennessee Valley Authority, BPA has continued to function as originally established.

BPA's authorizing legislation required it to sell power in accordance with the policy of "widest possible use of available

electric energy:" giving preference to publicly and cooperatively owned distribution systems. The BPA administrator was empowered to construct and operate necessary transmission and substation facilities and to enter ZO-year power contracts. Under J. D. Ross, the first BPA administrator, the agency rapidly set out to create a market for Bonneville power and to build the necessary transmission lines. The agency adopted a policy of a blanket or so-called "postage stamp" rate over the entire region served by its transmission system. This approach was designed to encourage the widest possible regional economic development. The initial uniform wholesale rate set by Ross recovered the costs of production and distribution while being cheap enough to stimulate demand.



Aerial view of the Bonneville Dam, 1940, looking downstream.

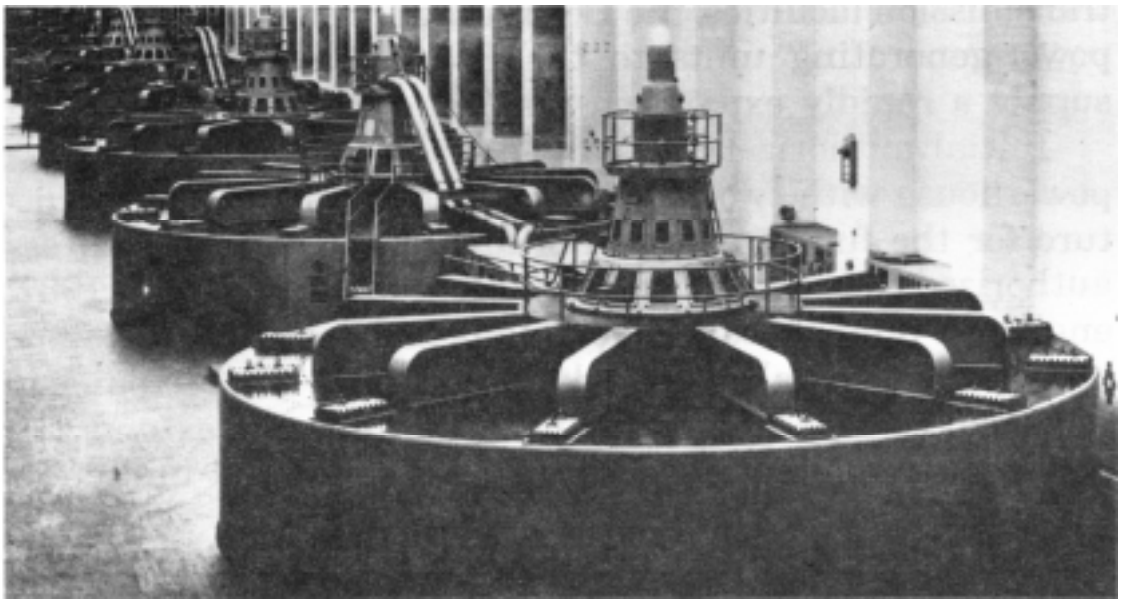
Under Ross's initial leadership, and over the opposition of private utilities, BPA built a high voltage grid for the region. Beginning in July 1938, the engineers at BPA swiftly overcame difficult problems of design, survey, and construction and soon had a network of high tension transmission lines radiating from Bonneville Dam. Next, BPA moved to integrate Bonneville power with that produced by other public and private power systems in the Northwest, allowing the agency to carry out regional planning and become the chief supplier of electric power. By 1941, the major components of the BPA power grid were in place. While BPA developed its

transmission facilities, the Corps of Engineers began adding power-generating units to the Bonneville powerhouse to supply a rapidly expanding market.

Initial authorization of Bonneville Dam provided for a powerhouse with two complete power units and a substructure for the future addition of four units. When Congress authorized the completion of the Bonneville project in 1937, engineers immediately began plans and design for the work necessary to install eight additional units. This expansion required considerable difficult excavation to extend the powerhouse to accommodate the four additional units over the initially authorized six.

Construction on Units 3 through 6 began in the fall of 1938, as the market for low cost electric power expanded beyond all forecasts. Since the first two turbines produced power well in excess of the guarantees, engineers increased the unit size to 54,000 kilowatts. Units 3 and 4 came on line in December 1940 and January 1941, respectively. With war clouds on the horizon, the Corps of Engineers started construction in the fall of 1939 of Units 7 through 10. Expansion of the powerhouse foundation and superstructure for the final units delayed work on Units 5 and 6. Unit 5 went into operation in September 1941 and Unit 6 began service in May 1942.

Excavation for Units 7–10 proved tricky. The powerhouse lay between the Oregon shore and Bradford Island in the middle of the Columbia River, and the engineers found the necessary cofferdams difficult to construct and maintain. Considerable overburden and an earthfill dike connecting the powerhouse with the island had to be removed. In addition, earth and rockfill cofferdams had to be placed up and down stream of the powerhouse. The need to sustain full power production while expanding the powerhouse meant that the lake could not be drawn down, complicating construction of the cofferdams. Once in place, they proved difficult to maintain. At one point, work ceased for several days when a wartime shortage of parts caused water pumps to fail and allowed the site to flood. The Corps placed the final four units on line at three-month intervals in March, June, September, and December of 1943.



Interior of the original powerhouse, Bonneville Dam, shows newly installed generator units.

The speed with which the Corps of Engineers installed generators at Bonneville and BPA constructed transmission lines during wartime conditions represents a remarkable accomplishment. The additional paperwork required to obtain clearances from the National War Production Board compounded the problems stemming from the drastic shortages of materials and skilled labor. Moreover, the continuous revisions of construction and installation schedules strained the coordinating abilities of the two agencies to meet the accelerated war industry and defense establishment needs in the Pacific Northwest. At war's end, the Corps had installed all the planned power facilities at Bonneville Dam, and BPA had constructed a transmission system of 2,737 circuit miles of high-voltage lines and 55 substations. The efficient operation of the Pacific Northwest power pool conserved power equal to the output of an additional plant of 135,000-horsepower capacity, saving 3 million barrels of oil and great quantities of coal for other strategic war-time uses.

The aluminum industry became the first new industry attracted to the Pacific Northwest by the cheap power from Bonneville. ALCOA opened the region's first aluminum plant near Portland in 1940. Reynolds Metals Company began producing aluminum the following year in Longview,

Washington. Although the first two aluminum plants represented private investment, the federal government built the next four plants as part of the war effort and operated them through contractors during the conflict. These plants accounted for a significant portion of the nation's aluminum production. By 1943, the Pacific Northwest manufactured 622,000 tons annually, accounting for more than 25 percent of the national total of 2.4 million tons. Much of this aluminum was used in building military airplanes.

After the outbreak of war, the Boeing Airplane Company rapidly expanded production. At their peak, Boeing's Seattle plants employed 50,000 workers and turned out 16 planes every 24 hours. By war's end, Boeing had built 7,000 B-17 Flying Fortresses and 3,000 B-29 Superfortresses. In all, the aluminum plants, powered by electricity from Bonneville and Grand Coulee dams, produced material to fabricate 50,000 warplanes.

Electricity from Bonneville also powered the shipyards at Portland and neighboring Vancouver, Washington. Using 35,000 kilowatts of electricity, the Henry Kaiser shipyards turned out a Liberty ship a day for an extended period, ultimately producing 322 of the ships. These 441-foot long freighters carried food, arms, and supplies vital to the Allied cause. The yards also built 99 Victory cargo ships and numerous escort aircraft carriers, tankers, and other vessels. In all, the three Portland-area Kaiser shipyards built 750 ships for the war effort. This output represented 27 percent of the United States' total ship production during the war.

The Bonneville project also contributed to the Kaiser shipbuilding effort in other ways. Kaiser's shipyard organization, which introduced innovations in ship construction, was staffed largely by men who had worked for the contractor in building Bonneville Dam. Drawing on their earlier experience at Bonneville which required coordinated teamwork to accomplish many tasks within a tight time frame, Kaiser management developed a system for preassembling ship parts in different buildings and then bringing them together on the ways. In addition, the shipyards employed approximately 1,000 ship carpenters who had learned their skill while crafting the forms for the hull-shaped draft tubes used in the powerhouse at Bonneville.

While inspecting war production facilities in the Pacific Northwest during the fall of 1942, President Roosevelt visited the Kaiser shipyards at Portland. After witnessing the launching of the Liberty ship *Joseph N. Teal,* which had been built in just ten days, the President pronounced himself greatly heartened: "I am very much inspired by what I have seen, and I wish that every man, woman, and child in these United States could have been here today to see the launching and realize its importance in winning the war."

The Bonneville project also aided the war effort by facilitating the movement of war material and supplies. At a time when railroad cars were in short supply, barges carried grain, ammunition, and other essential commodities through the Bonneville navigation lock. The scale of this wartime traffic through the Bonneville lock can be seen by comparing previous tonnage with that of the war years:

Years	Average Tonnage
1930–39	113,906
1940–45	766,593

Tonnage shown for Bonneville project prior to 1938 represents traffic at Cascades Canal and locks about 3.5 miles upstream, which was inundated by the pool formed at the completion of Bonneville Dam in February 1938.

Shrouded in great secrecy, Bonneville Dam helped supply power to the Hanford Engineer Works. The top secret work at Hanford required a heavy electrical load, eventually amounting to 55,000 kilowatts. This so called "mystery load" equalled the entire output of one of the new units installed at Bonneville. Hanford employed this power to produce plutonium for atomic bombs.

Speaking at the December 1943 dedication of the final power unit installed at Bonneville, Major General David McCoach, Jr., prophetically stated: "This accomplishment will undoubtedly shorten the war and save many American lives." The total power production of Bonneville and Grand Coulee dams between 1939 and 1946 amounted to 33.8 billion

kilowatt-hours. To ensure that no interruption in power occurred, the Bonneville project took extraordinary security measures. The Corps covered prominent buildings with camouflage paint and experimented with smoke screening by covering portions of the project in dense clouds of partially burned diesel fuel. The Army stationed almost 200 soldiers at the Bonneville project to protect transportation facilities, and the project posted its own guards in concrete "pill boxes" at strategic points on the grounds. The Bonneville guards mounted a .50-caliber machine gun inside the powerhouse and kept it pointed at the front door at all times.

The war effort placed heavy demands on the power production capabilities of Bonneville Dam. The Bonneville project met that demand, occasionally working its generators above rated capacity. With great foresight, during the dark days of the Depression, Corps engineers and planners devised a plan for utilizing the hydropower potential of the Columbia River. The construction of Bonneville Dam represented the initial step in accomplishing that hydroelectric program set forth in the Corps "308 Report." The completion of Bonneville Dam on the eve of World War II ultimately made available for the domestic war effort 518,000 kilowatts of power. This block of power proved essential to building the arsenal of aircraft, ships, and plutonium for the atomic bomb needed to win World War II.

Sources for Further Reading

The best discussion of Bonneville Dam's contribution to the war effort is William Willingham, *Waterpower in the "Wilderness": A History of the Bonneville Lock and Dam* (U.S. Army Corps of Engineers: Portland, Oregon, 1987).

Other useful studies include Gus Norwood, *Columbia River Power for the People: A History of Policies of the Bonneville Power Administration* (Bonneville Power Administration: Portland, Oregon, 1980) and Gene Tollefson, *BPA and the Struggle for Power at Cost* (Bonneville Power Administration: Portland: Oregon, 1987).