As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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DEPARTMENT OF THE INTERIOR
Rogers C. B. Morton, Secretary

BUREAU OF RECLAMATION
Gilbert G. Stamm, Commissioner
Electric power requirements are rapidly increasing along with the upward-spiraling world population. Part of the overall problem is finding sources of energy that are renewable and nonpolluting. Hydroelectric power from Grand Coulee Dam is just that.

With the existing capacity of 2,195,000 kilowatts the first stage of Third Powerplant construction makes available an added 3,900,000 kilowatts, and two new pump-generators at the other end of the dam can contribute another 100,000 kilowatts, for a total increase of 4 million kilowatts to the Grand Coulee Dam power complex. That is more power than is required for Seattle and Portland combined and brings total capacity to 6,195,000 kilowatts.

Part of the power from the Grand Coulee Dam is used for irrigation pumping and the rest is distributed over the lines of the Bonneville Power Administration into a Pacific Northwest power grid for commercial, industrial, and residential use.

During the summer months, when the demand for energy in the Northwest decreases, energy surplus to the needs of the area is transmitted over the Pacific Northwest-Pacific Southwest Intertie to help meet the needs of the residents of the Southwest, where the demand for energy increases as temperatures go up.
BACKGROUND

Initially, the plan for a dam was conceived to provide power and water for the irrigation of a large area of arid land in the Columbia Basin. After many years and much study of different plans, a small group made the recommendation to build a dam on the Columbia River and pump water from the lake it created up to a canal leading to the Grand Coulee, an old ice-age channel of the river. Banks Lake, created by damming part of the Grand Coulee, would permit gravity flow irrigation of the vast acreage of fertile but parched desert land in the Columbia Basin. Power production for commercial use was at that time a secondary purpose.

Those dedicated few people worked and persisted against strong odds until finally, in 1933, President Franklin D. Roosevelt approved the construction of Grand Coulee Dam. At first a low dam was to be built, but the high dam was approved in time to complete the structure. Construction of the dam and all related features of the Columbia Basin Project was assigned to the Bureau of Reclamation of the U.S. Department of the Interior. Grand Coulee Dam now backs water 151 miles to the Canadian border. Five hundred thousand acres now under irrigation in the Project produce more than one hundred million dollars annually in crop income.

U.S.-CANADIAN JOINT SYSTEM

Later, other farsighted planners laid the groundwork for construction of the Third Powerplant by negotiating a treaty with Canada which provides for the cooperative development of the Columbia River, with benefits to both countries. Under this treaty, Canada has built three dams in British Columbia for water storage purposes. They have a combined storage capacity of 15,500,000 acre-feet of water. The Treaty also permitted the construction in Montana of Libby Dam, which backs water 42 miles into Canada and has a storage capacity of 5,000,000 acre-feet. These increases in storage capacity above Grand Coulee Dam made building the Third Powerplant feasible.

Over 45 percent of the average yearly streamflow can be stored behind the various upstream dams as the snow melts in the high Rocky Mountains. In this way, much flood damage can be avoided and stored water can be drawn as needed to power generators at Grand Coulee, and at five other Government-owned dams and five public utility dams on the Columbia River below Grand Coulee.

BENEFITS SHARED

In return for building the three storage projects, Canada is to receive one-half of the additional power produced at the United States dams in the base system. The owners of the projects in the United States retain the other half. Canada elected to sell the first 30 years of its share of the entitlement to United States purchasers for approximately $254,000,000. This was paid in September 1964. Canada used the funds to build its Treaty dams. In addition, the United States paid Canada $64,400,000, representing one-half of the present value of the flood control benefits to be provided in the United States over the Treaty period.

BIG-BIG-BIG

The Third Powerplant has been a study in superlatives. Sizes have taxed the imagination, skills, and creativeness of engineers, manufacturers, and contractors alike.

Studies for installation of a third powerplant were started by the Bureau of Reclamation in 1962. At that time, units of 300,000 kilowatts (300 megawatts) were considered maximum practical size. Further studies showed that larger units were entirely feasible. Also, the increase in size decreased the cost per kilowatt pro-
duced. On the basis of these studies and assurance from manufacturers, a 600-megawatt rating was selected and the first three turbines and generators were purchased. Before the first three were installed, increased confidence in the practicality of larger units resulted in the award of another contract for three 700-megawatt units. This is almost six times the capacity of the 125-megawatt units in the existing powerplants.

The amount of water required, the size of penstocks and the turbines needed to power these units are all in the same big proportions. The penstocks are 40 feet in diameter, large enough so that three highway motor trucks could drive side by side in one of them with plenty of room to spare. Thirty thousand cubic feet of water per second will plunge through each of these penstocks to drive the turbines.

Because of their size, the turbines and many other parts of equipment in the Third Powerplant had to be shipped in small parts and fabricated or assembled on the site. The turbine runners, or water wheels, each over 32 feet in diameter and weighing in excess of 500 tons, were built from parts welded together at the jobsite.

The generators also were shipped in many pieces to be assembled and put together in the generator erection bay of the Third Powerplant. Each unit requires about 100 railroad cars for shipment of components. To give a little better idea of the fabrication of the first three 600-megawatt capacity units, there are 425,000 steel plates, each 0.018 inches in thickness, which have to be individually handled and stacked to make up the
stator (or stationary section) of the generator. The rotor (rotating inside portion) is 60 feet in diameter and weighs over 1,800 tons.

Bolts are something one can usually carry around in the hands, but not the coupling bolts that connect the runner to the 8-foot diameter shaft which drives the generator. These bolts are 8½ inches in diameter. With their nuts, they weigh 960 pounds each.

A 1,900-ton capacity gantry crane has been installed to handle the generator rotors. This hydraulic-lift crane will place the generator rotors with pinpoint accuracy.

In addition to the gantry crane, there are two 275-ton- and two 50-ton-capacity bridge cranes inside the powerplant. They are used to handle the turbines and other loads.

HIDDEN POWERLINES

Before construction could start on the Third Powerplant, it was necessary to modify the existing plants and route all generation to a new 230,000-volt consolidated switchyard. Originally there was a switchyard on each side of the river, one for each of the existing powerplants. The right switchyard was in the area now occupied by parts of the forebay dam and the Third Powerplant. A new high-voltage cable system running through oil-filled pipes conveys the power from the original powerplants through existing galleries in Grand Coulee Dam and an underground tunnel up to the new low-profile, consolidated switchyard. Construction of the consolidated switchyard without power interruption was probably little noticed by the public but technically it was one of the more difficult and hazardous parts of the project.

525,000-VOLT CABLE

To carry the power generated by the first three mammoth units at the Third Powerplant nine cables, each almost 5 inches thick, run from the powerplant transformers through a gallery in the dam and through a tunnel to a cable-spreading yard located high on the hills west of the dam. A man could safely place his hand on the cables an inch and a half from the copper core which carries enough electrical energy to supply the needs of 1.8 million people. Almost 11 miles of this 525,000-volt cable is installed through galleries and tunnels to connect the Third Powerplant to the cable-spreading yard.

110-volt extension cord draped over 525,000 volt cable from Third Powerplant to compare size.
VISITOR FACILITIES

Highlight for visitors will probably be the glass-enclosed elevator running from the top of the forebay dam down to an innermost part of the powerplant. It will travel approximately 465 feet along a 45 degree incline with a drop of 329 feet. There will be three stops where a variety of features can be viewed:

TOP STATION

- Entire complex including dam spillway and the three powerplants
- Third Powerplant penstocks carrying water to turbines
- Tailrace where water re-enters the river
- Towns above and below the dam
- Tubes carrying water pumped from Lake Roosevelt to Banks Lake Feeder Canal for irrigation
- Columbia River flowing north before it bends back

MIDSTATION (Observation Balcony)

- Third Powerplant generators and a gantry crane which can lift 1,900 tons
- Third Powerplant Tailrace, right and left powerplants, and dam face

LOWER STATION

- A giant shaft as it turns one of the biggest generators in the world
- Powerplant controls and instruments
- The tunnel-like gallery in the underground part of the powerplant

OTHER PLACES TO VISIT

Self-guided tours in the Left Powerplant and Pump-Generator Plant are also open. There are presently six pumping units with 65,000-horsepower motors, each capable of pumping 1,600 cubic feet of water per second from Lake Roosevelt up 280 feet to the Feeder Canal going into Banks Lake. There are also two reversible units, each capable of pumping about 1,700 cubic
feet of water per second and then, when the water is reversed, acting as turbines to generate 50,000 kilowatts of power. There is room in the Pump-Generator Plant for four additional units to be installed as needs develop.

Also to be seen at the Pump-Generator Plant are displays and a relief map showing Banks Lake, the Columbia Basin area now under irrigation and areas to be placed under irrigation. A visitor-actuated tape recording explains what the map portrays. There are other such recordings at various viewpoints around Grand Coulee Dam to explain the immediate panorama and add to visitors' understanding and enjoyment.

The Washington State Park system and the Departments of Game and Highways have developed areas on Banks Lake with camping and other facilities, under a cooperative agreement with the Bureau of Reclamation. Although Banks Lake was created to store water for irrigation, its 100 miles of shoreline and beaches provide ample space for camping, fishing and swimming, with plenty of open water for boats and water skiers. At Steamboat Rock State Park, there are boat-launching ramps and a 100-unit camper area with a mile-long sandy beach.

The town of Electric City, only a few minutes from Grand Coulee Dam, also maintains camping and boat-launching facilities on Banks Lake.

The Coulee Dam National Recreation area, stretching down the 151-mile length of Franklin D. Roosevelt Lake, is administered by the National Park Service, U. S. Department of the Interior, under an agreement with the Bureau of Reclamation and the Bureau of Indian Affairs. The Park Service has camping and recreation facilities just upstream a short distance from the town of Grand Coulee at Spring Canyon, which is one of a total of 25 developed areas for the visitors' enjoyment along the lake.

More information on points of interest is available at the Visitors Information Center on the west bank of the river just downstream from Grand Coulee Dam.
FUTURE ADDITION

The Third Powerplant is so designed that another group of units can be added as power needs dictate and upon authorization by Congress. With such an addition, the total complex is scheduled to have a capacity of about 10,000,000 kilowatts, which would again make Grand Coulee Dam the largest power producing complex in the world.

Banks Lake provides beauty, recreation, and water storage.