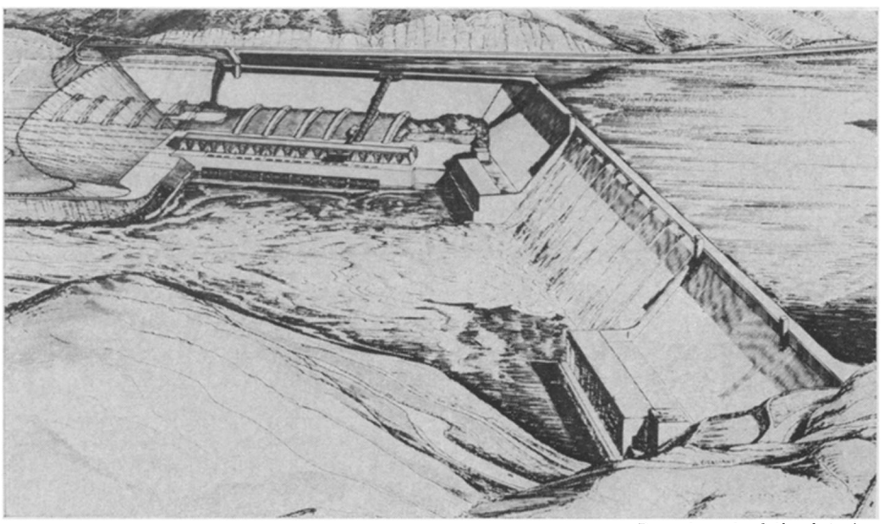

Department of the Interior

New dam and power plant will give Grand Coulee an L-shaped configuration.

ENGINEERING

Grand Coulee: Heading toward first place

A third power plant, which will make Coulee the world's top electric-producing facility, also poses engineering design problems

by Edward Gross

Although nowhere near being the biggest dam in the world, the 550-foot-high Grand Coulee still squats majestically on the Columbia River in central Washington. With its total generating capacity of 2 million kilowatts, only one other power-generating station in the world surpasses it: the Soviet dam at Krasnoyarsk in Siberia, with 6.1-million-kilowatt capacity.

As a result of action recently taken by Secretary of the Interior Walter J. Hickel, the 28-year-old Grand Coulee —if all goes well—should pull ahead of the Soviet station by 1985 and become the world's number one electric-generating plant. Hickel awarded a $112.5 million contract—the largest in the history of the 68-year-old Bureau of Reclamation—for the construction of an additional third power plant at the Grand Coulee. At least a dozen companies will be involved in the enormous enterprise.

The addition will start with six immense hydroturbines and generators. Each of the six units will have a capacity of 600,000 kilowatts, the largest in the world. Eventually, the power plant will be expanded to include six more units of the same size. When completed, the Grand Coulee's total generating capacity will hit 9.6 million kilowatts, half again the size of the Krasnoyarsk giant. At present Congress has authorized construction of only the first six units, with the remaining six still to be approved. If all goes well, the first six will be completed in 1978.

"Everything about this third power plant installation is so large as to be nearly unbelievable," says Ellis L. Armstrong, commissioner of the Bureau of Reclamation. "It is certain to take its place as one of the great wonders of the modern engineering world."

As an example of the sizes involved, the penstocks, the pipes that will carry the water to turn the turbines, will be 40 feet in diameter, large enough to transport about twice the average flow per second of the Colorado River through the Grand Canyon. In addition, the turbine shafts will be 7 feet in diameter, compared to the 3.6-foot shafts now at Grand Coulee. The power plant will be housed near the toe of the Forebay Dam, an L-shaped extension some 20 stories high, 1,128 feet long and 217 feet wide along the right abutment of the Grand Coulee.

The size of the power units poses some unique engineering problems. The units are so large that in order to be shipped, they must be broken down into segments. This is nothing new—large pieces of generating equipment have traditionally been shipped this way. But in this case, there is no existing information for segmenting such large sizes and then putting the pieces together so they work properly. The segments will have to be custom tailored from start to finish.

"This isn't anything insurmountable," says C. M. Brinsley of the Westinghouse generator division in Pittsburgh. "It's just something that requires engineering innovation and effort."

Despite segmentation, transportation of the monsters will still be a headache. Railroad and highway clearances and load limits will not permit some of the larger, heavier parts to be carried by train or truck. The result is that some of the equipment, such as transformers, generator-bearing supports and shafts, probably will have to be shipped by barge on the Columbia River.

The equipment will be assembled on site and tested there to see if the designers have done their job. The design must take into account operational problems that will arise because of equipment size. For example, the stresses that normally result from rotary motion of turbine blades will be aggravated in the new, larger units.

The plant machinery is so large and the working space in the power plant so limited that installation and assembly of the equipment will be tricky. The 2,000-ton rotors of the generators are a special worry. Because of space and time considerations, a crane was ruled out, so a hydraulic gantry to install and assemble them was decided upon. This giant platform, "the largest piece of handling equipment ever to be installed in a Bureau of Reclamation power plant," according to H. G. Arthur, chief designing engineer at the bureau in Denver, will have a 2,000-ton lifting capacity, run on steel tracks and have a 95-foot span.

Westinghouse anticipates problems but expects success. "We are strongly confident; otherwise we wouldn't have taken the job," says Brinsley.

The plant is actually part of a larger, over-all scheme to supply power needs for the burgeoning Pacific Northwest. Because of the urgent situation there and because of treaty commitments made with Canada, President Nixon exempted the project from this year's budgetary cuts in public construction spending. □