IN THE SCIENTIFIC AND TECHNICAL COUNCIL

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SELECTING THE TYPE OF DAM FOR THE BUREYA HYDROELECTRIC PLANT

The Scientific and Technical Council of the Ministry of Power and Electrification of the USSR has examined designed proposals for the type of dam and scheme for the organization of construction work on the Bureya hydroelectric plant, which were drawn up by LenEidroproekt in conformity with the need to define more precisely the initial stage of technical design for structure layout and the selection of the type of dam to be constructed for this hydraulic facility. In the design material presented, the type of dam was selected by comparing alternate schemes for the facility with three types of dams: rock-and-earthfill, massive-buttress, and arch. An alternate scheme was also examined for a gravity dam.

Geologic conditions at the site proposed for the basic structures are characterized by the occurrence of durable slightly permeable granitic rock. The structures are designed to resist seismic activity. Local construction materials for the rock-and-earthfill dam would be acquired partly from useful excavations and quarries located within 3-4 km of the site; to obtain coarse aggregates for the concrete, it would be necessary to crush rock from gravel pits opened within 30-40 km of the site; sand for the concrete may be acquired from a pit near the site. It requires washing. An 80-km road would provide a transportation link between the railroad and construction site.

In the scheme with the rock-and-earthfill dam, the following structure would make up the hydraulic facility: a dam with a height of 142 m, a crest length of 740 m, and a volume of 18 million m³ of which 6.8 million m³ would be placed in the central prism by hydraulicking. The plant unit and intake structures would consist of a common feeder canal and two tunnel intakes. Construction flows (16,000 m³/sec) would be passed through two tunnels with a 17 x 15-m section and an overall length of 1700 m. A portion of these tunnels would be used during the operating period as permanent intakes. The facility would be constructed in a trench behind cofferdams 60 m high.

The hydraulic facilities with a concrete (massive-buttress, gravity, and arch) dam would include, in addition to the dam, a near-the-dam-type powerhouse with an intake and penstocks within the body of the dam. The construction flows would be passed through openings in the body of the dam without building service tunnels.

Analyzing the design materials presented, the Scientific and Technical Council considered that the 140-m-high earth dam with the hydraulicked central prism does not have analogies in the hydraulic-construction practice, and hydraulicking operations could be carried out only 5 months of the year, and also considered the cost of the alternate schemes examined in the plan, which was approximated within the limits of computational accuracy, and recommended constructing the Bureya plant with a concrete gravity dam, a near-the-dam powerhouse, and combined intakes. The setting of the facility with the concrete dam will make it possible to utilize to a greater degree the experience accumulated by the construction organization in building the Zeya concrete dam, and available construction mechanisms, branch establishments, and equipment.

Under conditions inherent to the Bureya facility, the concrete gravity dam will make it possible to start up the first units under a reduced head (up to 0.5 of the design head); this will make it possible to produce an additional 10-12 billion kWh of electricity.

DESIGN OF THE MEZEN' AND LUMBOVKA TITIAL POWER PLANTS

The All-Union Lenin Order S. Ya. Zhuk Scientific-Research Institute of Design and Exploration has developed basic positions for the technicoeconomic justification of the Mezen'
and Lumbovka tidal power plants using floating designs. The feasibility of constructing a tidal power plant with a capacity of the order of 10 million kw and an annual generation of 32 billion kWh in the Bay of Mezen' (tides of 9 m) is examined in this study. The width of the construction site is 88 km, of which 71 km will be closed with a thick dam built of local materials placed to an average height of 26 m. In Lumbovka Bay on the Kolski Peninsula, it is planned to design a tidal power plant with an overall capacity of 360 MW and an annual power generation of 1 billion kWh. The basic width of the 12-m-deep site will be spanned by a dam of local materials.

A discussion of this material demonstrated the complexity of the problem of utilizing the energy of the tides on the shore of the White Sea, which is associated with the need to develop new construction methods and the building of modified hydraulic units with a turbine diameter of more than 8 m. Consumption of the relatively inexpensive electricity is not addressed in the design. The Scientific and Technical Council discussed the study and acknowledged its continuation expedient in ascertaining the technical feasibility of utilizing the energy of the tides in the distant future and to determine the economic-energy effectiveness under both conditions of the transmission of their capacities in the power system and the creation of power-consuming industries in the regions where the plants are located.

TECHNICOECONOMIC ESTIMATE OF THE KAMBARATIN HYDROELECTRIC PLANTS
ON THE NARYN RIVER

The Central Asian Division of the All-Union Lenin Order S. Ya. Zhuk Scientific-Research Institute of Design and Exploration has developed a technicoeconomic estimate for the Nos. 1 and 2 Kambaratin hydroelectric plants, which calls for the harnessing of the middle segment of the Naryn River, and the Toktogul Reservoir, making use of falls of 233 and 54 m. In the region of the sites under consideration, only rock is available as a construction material.

The Kambaratin plants under design are treated as purely power projects, considering that the reservoirs already existing in the basin provide multiyear flow regulation and virtually complete utilization of the water resources of the Syrdarya River.

The sequence adopted for filling the reservoir to its useful capacity of 2.15 km³ by tapping the river flow without altering the spilling conditions in the lower pool of the Toktogul hydraulic facility due to additional drawdown of its reservoir will make it possible to place the plant in service without detriment to land under irrigation in the Syrdarya Basin, or to the generation of electricity in the network of hydroelectric plants situated downstream. The rated capacity and power generation will be 1600 MW and 4.6 billion kWh/yr, respectively, for the No. 1 plant, and 240 MW and 1 billion kWh/yr for the No. 2 plant.

An alternate scheme calling for layout of the No. 1 facility with a uniform blast-fill dam and a concrete arch dam are considered in the design. The plan recommends the alternate scheme calling for a facility with a uniform blast-fill dam with a height of 255 m, a crest width of 200 m, and a fill volume of 80 million m³. Water losses due to seepage through the body of the blast-fill dam will amount to ~ 8% of the power potential of the flow at the site. It is planned to construct the Nos. 1 and 2 plants under one construction title. The total construction time will be seven years.

The Scientific and Technical Council has noted that in terms of their own parameters and mountain-geological conditions, the damsites for the Nos. 1 and 2 Kambaratin plants are favorable for dam building by the blast method. Many problems associated with the possibility of acquiring explosives in amounts of more than 450,000 tons, storing them for 4 years, and environmental protection as a result of the massive explosions, however, did not receive adequately convincing development in the design.

Considering the uniqueness of the blast-fill dam for the No. 1 plant as regards parameters, design, and methods used for this construction, there are no analogies in either domestic or foreign hydraulic-construction practice, bearing in mind that the costs of the concrete arch and blast-fill dams were found to be extremely close, and also considering significant seepage. The Scientific and Technical Council has recognized the need for additional examination of the problem concerning the selection of the type of dam for the No. 1 plant. In this case, it is necessary to consider that the construction organization that will build the