The performance characteristics of hydroelectric stations are highly conformable to conditions in a com-
munist society. They utilize renewable resources, are easily subjected to automation, are highly flexible, are charac-
terized by good hygienic working conditions, and have a small number of operating personnel and a low net power
cost. The basic structures have a long service life. For instance, that of earth and concrete dams reaches 100 years
and more. The transformation of energy in hydroelectric stations is highly efficient, reaching 94% for large hydro-
electric turbines, and 98% and higher for large hydrogenerators. However, the specific capital investments and con-
struction time are usually greater than for thermoelectric stations. In addition, the economic indices of hydroelec-
tric stations depend to a significant degree on natural conditions. Therefore, one must not assume a priori that they
will be economical under any conditions. It is necessary in each case to make quantitative and qualitative economic
comparisons with an alternate, interchangeable thermoelectric station, taking into account the over-all effect of
the hydroelectric station on the national economy.

The role of hydroelectric stations in regional development is of great importance to the national economy.
Many examples may be cited of the development of large industrial regions based on hydropower. The power-
industrial complex arising in connection with the Bratsk Hydroelectric Station is well known. The Dnieper com-
plex, inseparably associated with the V. I. Lenin Dnieper Hydroelectric Station, may be cited from the experience
of past years. The multi-metal mining industry in the Altai Region, and the industries of the Kola Peninsula, Ar-
menia, etc., are also exemplary of developments based on hydropower.

Hydroelectric stations also exerted considerable influence on the development of high-voltage transmission-
line technology and the building of integrated power systems. Transmission voltages which are directly associated
with construction of some hydroelectric stations are as follows: 110 kV ac (a basic voltage)—the V. I. Lenin Volkhov,
placed in operation in 1926; 154 kV ac—the V. I. Lenin Dnieper, placed in operation in 1932; 220 kV ac—the G. O.
Gratieito Lower Svir, placed in operation in 1933; 500 kV ac—the V. I. Lenin Volga; and 800 kV dc—the XXII Con-
gress of the CPSU Volga. The last two are base stations for the integrated power system of European USSR, the
capacity of which is 53 million kW. The Irkutsk, Bratsk and Krasnoyarsk Hydroelectric Stations foreordained the
installation of the second largest power system in the Soviet Union—the Central Siberia integrated system.

The regulatory role of hydroelectric stations is of ever greater importance. Increased peak electrical loads
are being met most effectively, both technically and economically, by hydroelectric stations—a practice which
demonstrates their high flexibility to the whole world.

Most frequently hydropower proves to be the leading component in multipurpose stream use, and has a deter-
mining role in constructing the large water arteries of the country into hydrocomplexes. It suffices to point to the
leading role of hydropower in construction of the transport-power hydrocomplexes on the Volga, Kama, Dnieper,
Svir, Volkhov, Irtysh, Enisei and other rivers. In Central Asia and in Transcaucasia, power-irrigation hydrocom-
plexes prevail—Mingechaur on the Kama, the Razdano-Zangin Sequence hydrocomplex on the Zanga, the Kairak-
Kum and Chardarin on the Syr-Darya, the Nurek hydrocomplex, under construction on the Vakhsh, the Toktogul on
the Naryn, and the Chirkei on the Sulak.

The brilliant forecasting by V. I. Lenin of the large role of hydropower in the electrification of the country
and the advantages of multipurpose utilization of water resources was clearly reflected in the famous plan of the
State Commission for the Electrification of Russia (GOELRO). While the capacity of hydroelectric stations in Tsarist
Russia in 1913 was only 1.5% of the total (16,000 kW), according to GOELRO after 10 to 15 years 640,000 kW would
be brought into operation at large hydroelectric stations, which would raise the proportion to 36%. V. I. Lenin's
great role in resolving problems of waterpower utilization and in the construction of our first hydropower station,
the Volkhov (which is appropriately named for him), is well known.
A large and complicated group of problems arising during the planning and construction of hydropower complexes, the considerable capital investments in their structures, and complicated problems of the creation of reservoirs and the regulation of river flow foreordained the widespread raising of questions concerning the role of hydroelectric stations in the national economy of the country and focussed serious attention on problems of hydropower economics.

In many branches of the national economy, the "minimum net production cost" principle was used for a long time for the optimization of alternates in technical-economic design. For power, accordingly, the principle of minimum net cost of electric power in the system was used. In conformity with this principle it was profitable to increase the design head of hydrocomplex, or the height of a dam, the installed capacity of a hydroelectric station, etc., as long as a subsequent small rise of the parameter would give the same power cost as an interchangeable thermal condensation electric station. A line diagram for selecting the most advantageous parameter $P_e$ conforming to the normal backwater level ($NPY$) in accordance with this principle is shown in Fig. 1. The value of the investigated parameter $P_g$, with which the cost per kW of supplementary power $S_{sup}$ proves equal to the average cost of hydroelectric power $S$ during a subsequent small increment of the parameter, conforms to the minimum hydroelectric power cost. The most advantageous value of the parameter $P_e$ is determined by equating the net cost per kW of supplementary hydropower with that from an interchangeable thermal condensation station; that is, $S_{sup} = S_{int}$. At the same time, the minimum net cost of system power is provided.

The subsequent development of the method evaluating the effectiveness of capital expenditures in the national economy led to the conclusion that the method of minimum production cost involves raising the capital-consuming parameters of structures; for example, the design head of a hydroelectric station, with which the height of a dam, area of flooded land, etc., are associated.

As long as thirty years ago, many engineers, in planning capital-consuming hydrotechnical, transportation, and other structures, relinquished the use of the "minimum net cost" method in design, and began to use the "time of reimbursement of supplementary capital investments" method. In conformity with this method, alternate 1, with a higher capital investment $K_1$ is considered economically justifiable when the supplementary capital expenditures $K_1 - K_2$ are reimbursed by the savings in annual expenses $J_2 - J_1$ within the permissible time $T_{years}$:

$$T = \frac{K_1 - K_2}{J_2 - J_1} \leq T_\text{H}.$$  \hfill (1)