

ARGUMENTATION ON THE POSSIBILITY OF RELOCATING THE HYDROPOWER PLANT OF THE ENGURI HYDROELECTRIC STATION IN ORDER TO ENSURE THE ENERGETIC SECURITY OF THE FUNCTIONING OF GEORGIA'S POWER SYSTEM

G. TSINTSADZE

Be received 28.11.2014

Dedicated to T.Gegelia, Al.Losaberidze, P.Lomaia, I.Amiredjibi

The mass media has recently spread information that the government of Abkhazia has declared a claim that the hydropower plant (HPP) of the Inguri HES should be placed under its management (or transferred into its ownership). The HPP is located on the territory of the Gali district in Abkhazia. Analogous claims periodically appeared in the press also in the preceding years depending on a political situation, but the signing of the Russian-Abkhazian treaty has made it necessary to consider this issue from a different angle. Proceeding from the current political situation in Abkhazia it is not difficult to guess in whose hands the management of the Inguri HES may turn out to be.

The Inguri HES is one of the strategic enterprises and the foundation of Georgia's energetic security because its specific weight accounts for 40% of the total power potential of Georgia. The Caucasus is a hardly predictable region and therefore nothing that might happen in the future can be excluded.

Today's political and economic situation demands that unless the jurisdiction of Georgia is restored all over its territory, the Georgian government must take steps in order to prevent a prospective crisis situation in the energy sector of the country.

One of the ways in this direction is to change the location of the HPP of the Inguri HES.

The mass media has recently spread information that the government of Abkhazia has declared a claim that the hydropower plant (HPP) of the Enguri HES should be placed under its management (or transferred into its ownership). The HPP is located on the territory of the Gali district in Abkhazia. Analogous claims periodically appeared in the press also in the preceding years depending on a political situation, but the signing of the Russian-Abkhazian treaty has made it necessary to consider this issue from a different angle. Proceeding from the current political situation in Abkhazia it is not difficult to guess in whose hands the management of the Enguri HES may turn out to be.

The Enguri HES is one of the strategic enterprises and the foundation of Georgia's energetic security because its specific weight accounts for 40% of the total power potential of Georgia. The Caucasus is a hardly predictable region and therefore nothing that might happen in the future can be excluded.

Today's political and economic situation demands that unless the jurisdiction of Georgia is restored all over its territory, the Georgian government must take steps in order to prevent a prospective crisis situation in the energy sector of the country.

One of the ways in this direction is to change the location of the HPP of the Enguri HES.

The question of changing the location of the HPP was posed even in the original stage of the Enguri HES designing. Several versions of the project realization were considered. The decision was made in favor of the version that provided the highest peak power needed to

cover the requirements of the power system of the south of Russia. In the Soviet times that solution of the question was perhaps justified by the then existing technical and economic conditions, but the creation of such a large hydroelectric plant as the Enguri HES led to a number of problems which arose in the course of its operation. Here we will indicate three of them. The first problem concerns the increase of filtration waters loss from the high-pressure diversion channel, especially in its tailrace part; the second problem is the increase of head loss because the length of the high-pressure diversion channel was increased up to 16 km, and the third problem is the dewatering of the Inguri river bed over practically 50 km, which has caused the decrease of the ground water level and changes in the ecological situation in the river functioning zone.

In view of the above-said, a new lay-out scheme (Fig. 1, Fig. 2) of the Enguri HES has been proposed, which in particular includes the building of a new HPP with waste water discharge into the natural bed of the Enguri river in the Tsalenjikhi district. It should be said here that the realization of this project is connected with essential expenses, but preliminary estimations show that these expenses will be repaid within a very short time and that the new lay-out scheme of the Enguri HES, when it is realized, will be more efficient than the presently operated scheme in the economic and ecological as well in the political respect.

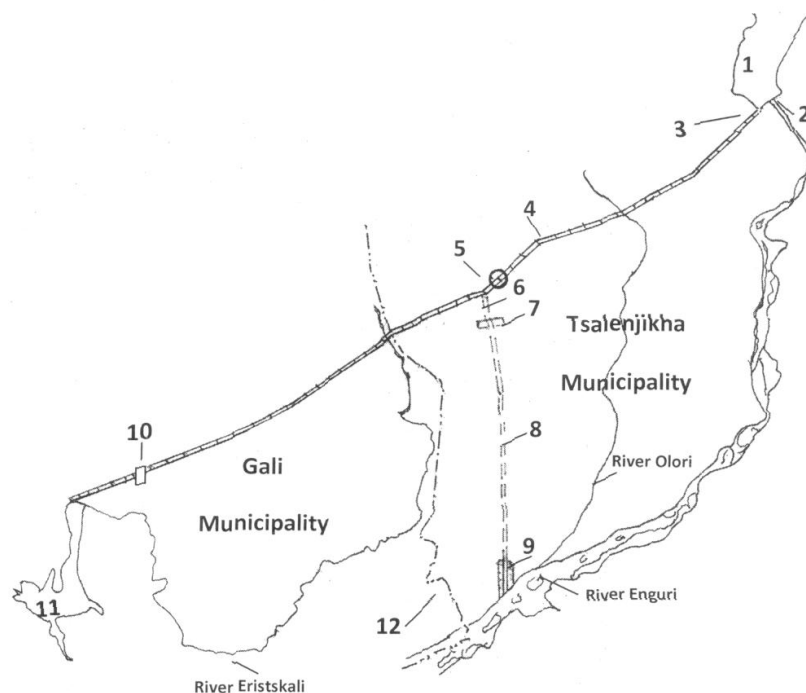


Fig. 1. General lay-out scheme of the proposed new Inguri electric power station in Tsalenjikha:
 1 – water storage reservoir; 2 - arch dam; 3 - water intake; 4 - pressure diversion tunnel $D=9.5\text{m}$, $L=7750\text{m}$, $i=0.0038$; 5 - surge tank; 6 - penstock; 7 - new underground power station in Tsalenjikha; 8 – tailrace tunnel, $L=5750\text{ m}$, $i=0.0013$; 9 – gravity-flow conduit; 10 – Enguri underground power station in Gali; 11 – Eristsckali water storage reservoir;
 12 - administrative border

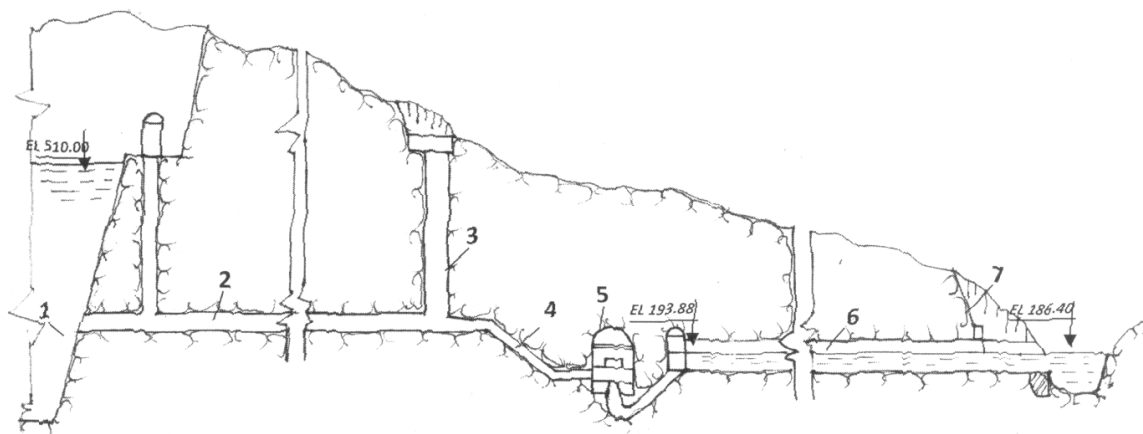


Fig. 2. General profile of the hydro-engineering structures of the proposed new Enguri power station:

1 – water intake; 2 - pressure diversion tunnel D=9.5m, L=7750m; 3 - surge tank; 4 - penstock; 5 - underground power station; 6 – tailrace tunnel; 7 - free-flow channel; 8 – Enguri river

The proposed version of the new Enguri HES lay-out project foresees the operation of the following already existing structures: the arch dam, water storage reservoir of seasonal regulation, water intake structures, mechanical equipment of the dam and water discharge works, pressure diversion tunnel about 7750 m long and infrastructure in the nearby area.

The following hydraulic engineering structures will have to be built additionally: the surge tank, penstock, underground HES building, combined water removal tract (tunnel, channel), open distribution system.

Hydraulic and hydroenergetics engineering calculations showed (see the longitudinal hydro-engineering schematic profile Fig.2) that for the existing design discharge of $450 \text{ m}^3/\text{sec}$ by the proposed scheme the design head decrease is achieved due to locating the HES building and the water removing tract to higher marks of the terrain.

Therefore the total head at the HES is equal to $510.0 - 193.875 = 316.125 \text{ m}$. Taking into account head losses of the water supply tract which are equal to 21.07 m , the net at the new HES will be equal to 295.06 m against 353 m by the existing scheme.

The design head value should be taken equal to 260.06 m against 325.0 m , for which the units and mechanisms of the Enguri HES were designed to operate.

Thus, the power parameters of the new HES scheme should be as follows: the design discharge is $450 \text{ m}^3/\text{sec}$, design head is 260.06 m , capacity is 1053.0 thou. kWt , average power generation is $353 \text{ billion kWt.hour}$, quantity of hours of installed power utilization is 3320 hour .

According to the preliminary estimations with large margin, the cost of realization of the proposed scheme is 600 million USD .

During the time of HES operation shut-down and after putting it into operation, residents of Abkhazia will have as before a regular supply of electric power for the normal functioning of domestic appliances and industrial enterprises.

With the timely delivery of building machines and mechanisms, the construction completion time will not exceed 2.5-3 years if the detailed engineering project is available.

This proposal on the possibility of relocating the hydropower plant of the Enguri HES has a number of advantages as compared with the existing scheme. Among them the ecological and political aspects are the basic ones. According to the present-day conceptions of ecological security, the types of hydraulic engineering structures which dewater the river beds in densely populated regions with highly-developed agriculture should not be built at all. As to political agreements on the joint use of natural resources, they must be concluded between the interested parties having stable relations and not resorting to periodic blackmailing. Therefore in the current situation, taking into account the energetic security of the country, the realization of the proposed project is considered to be the only correct way out the formed predicament.

Acknowledgement. The author wishes to express his gratitude to Professor, Doctor of Science R.Pataraia for reviewing this paper and to R.Kirkitadze, the director of “Kirkitadze & Co.,Ltd.” for providing topographic materials.

GURAM TSINTSADZE, Professor, Doctor of Techn. Science
E-mail: Guram.Tsintsadze@gmx.de