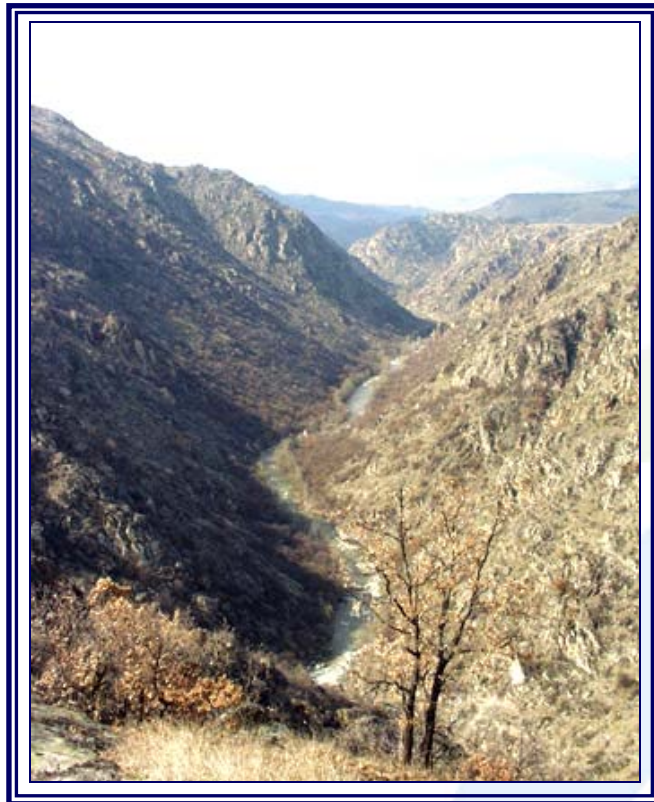


HPP GALISTE



Skopje, 2012



The water management plan for utilization of the r.Crna Reka waters in its middle and bottom course, foresees the waters to be utilized for the power-irrigation purposes.

In this stretch of the river course, there are natural conditions for construction of high dams and formation of water storages, which will provide the available head to be used for power generation, providing at the same time

a possibility for irrigation of the agricultural areas of the Tikves region.

The concept for the utilization of the r.Crna Reka from Skocivir up to the estuary of the r.Crna Reka into the r.Vardar, anticipates formation of three dam storages: Cebren, Galiste and Tikves.

The available potential of the r.Crna Reka has been so far utilized only in the bottom gorge stretch, executing the construction of the high dam Tikves. The upstream water storages Cebren and Galiste has exclusive electric power importance, providing conditions for formation of huge water storages and regulating of the flows of the r.Crna Reka, all with the purpose of their complete utilization.

The future dam site Galiste, located in the middle part of the gorge stretch of the r.Crna Reka, at the end of the existing water storage Tikves, i.e. 54 km. upstream of the r.Crna Reka estuary into the r.Vardar.

The profile, at which the construction of a high dam is foreseen, has been selected on the basis of the favorable topographic and engineering-geological, geotechnical and geomechanical conditions.

The construction of the Galiste Dam will form water storage, volume of $344 \times 10^6 \text{ m}^3$.

The high dam is foreseen to be of the rockfill type, having a central clay core, while the hydro power plant is foreseen to be located near the dam itself. The HPP includes the following structures: rockfill dam with a clay core, grouting curtain, upstream and downstream cofferdam which enters the dam body, a diversion tunnel which will serve as a foundation outlet, a spillway (overflow) organ - shaft overflow, supply organ, power house comprising of three units as well as a switch yard 110 kV located in the area between the dam and the power house.

The approach to the dam site will be through the road Prilep-Rasimbeg Bridge-v.Vitoliste. From the v.Vitoliste up to the weir crest, a new road will be constructed, total length of 20 km, as well as an access road from the weir crest up to the power house, length of 2 km. These roads are located on the right river bank.

The Investment-Technical documentation for the HPP Galiste has been elaborated on the Preliminary Design level, by HEP - Skopje in 1989/90.

The final decision for the optimal utilization of the Crna River cascades was made after preparation of the Feasibility Study *Investment Options in the Energy Sector-Optimisation of the River Crna System for Electricity Production*, prepared by Exergia S.A. in 2003 and financed by PHARE PROGRAMME.

Tender documents for BOT concession were prepared in June 2006.

Hydrological data

The hydrological data are concerning the chronological period 1946-2005. According to the calculations the available flow is 28,39 m³/s. The measurements are recorded at monitoring stations located at three locations: Skocivir, Rasimbeg Bridge and Tikves.

Environmental aspects

In general, the positive aspects to construct hydro power plant (HPP) Galiste in the Crna River preponderate the negative impacts of construction, impounding and operation. The multiple benefits for the region and the country include the improvement of living conditions, the improvement of the hydrological monitoring and the possible micro and macro economic spin-offs. This solution has smaller draw-downs that cause less negative environmental impacts through reduced flooded shorelines and improved reservoir management. The application of appropriate operation patterns will result in lower visual impacts on the landscape, reduced erosion, improved micro-climate, reduced health risks, better fish spawning areas etc.

Through Cebren HPP the hydrological conditions of the Crna River will then be controlled in order to allow an appropriate ecological minimum discharge as well as water discharges for impounding of the other down stream reservoirs as well as water requirements for irrigation and power generation of Tikves HPP.

Power generation

The Galiste HPP is designed with conventional units and an installed capacity of 193,5 MW.

The Galiste HPP will be used as a peak load power plant. According to the analyses performed in the Feasibility Study Galiste HPP will annually generate 262,5 GWh.

Construction cost

According to the calculations in the Feasibility Study, estimated cost of the plant construction amounts 200.241.000 EUR, and:

Preliminary works	8.388.000 EUR
Preparatory works	32.331.000 EUR
Main civil works	119.823.000 EUR
Equipment	39.700.000 EUR

The project construction will be realized on the BOT concession basis.

1. HYDROLOGICAL FEATURES

MULTY-YEAR WATER INFLOW ONTO THE PROFILE	895.30 x 10 ⁶ m ³
AVERAGE AVAILABLE FLOW PER YEAR	28.39 m ³ /s
AVERAGE PRODUCTION PER YEAR	262.50 x 10 ⁶ kWh

2. HYDROTECHNICAL FEATURES

2.1 WATER STORAGE (*Dam Lake*)

TOTAL VOLUME	344.00 x 10 ⁶ m ³
USEFUL VOLUME	258.00 x 10 ⁶ m ³
AREA	8.00 x 10 ⁶ m ²
NORMAL LEVEL	392.00 m.s.l.
MAX. LEVEL	396.00 m.s.l.
MIN. LEVEL	342.00 m.s.l.

2.2 DAM

DAM TYPE	ROCKFILL
STRUCTURAL HEIGHT	141.50 m
SURVEY HEIGHT	138.50 m
DAM VOLUME	7.380.350 m ³
WEIR CREST LENGTH	477.00 m
WEIR CREST WIDTH	10.00 m

2.3 EVACUATION ORGANS

2.3.1 SPILWAY (*Overflow*)

TYPE	shaft
CAPACITY	1500 m ³ /s
Length of the vertical part and the bend	78.22 m
TUNNEL LENGHT	470.00 m
Length of the transition part and fast water course with a ski ramp	56.48 m
SHAFT DIAM	28.76 m
TUNNEL DIAM	8.30 m

2.3.2 FOUNDATION OUTLET

TYPE	tunnel	
CAPACITY	112.58 m ³ /s	
SIZES:		
INCLINED TUNNEL	t _h =3.0 m	l=18.50 m
TUNNEL	t _h =7.5 m	l=305.17 m
PIPELINE	t _h =2.5 m	l=396.50 m

2.3.3 SUPPLY ORGAN

DIAMETER	t _h =5.50 m
LENGTH - TOTAL	l=550.39 m

3. BASIC ENERGY PARAMETERS

NUMBER OF UNITS	3
RATED FLOW	180 m ³ /s
RATED FLOW PER UNIT	60 m ³ /s
AVERAGE ANNUAL GENERATION	262,5 GWh
RATED POWER PER UNIT	64,5 MW
VOLTAGE LEVEL	110 kV

4. ELECTROMECHANICAL PARAMETERS

4.1 TURBINE

TYPE	FRANCIS
RATED POWER PER TURBINE	64,50 MW
NUMBER OF REVOLUTIONS	300 r/min.
RATED FLOW PER TURBINE	60,00 m ³ /s

4.2 GENERATOR

TYPE	3 phase-synchron
RATED POWER	71,90 MVA
VOLTAGE LEVEL	15,75±5% kV
NUMBER OF REVOLUTIONS	300 r/min.

4.3 TRANSFORMER

RATED POWER	71,90 MVA
TRANSITION RATIO	15,75/110 kV

4.4 SWITCHYARD

110 kV SWITCHYARD COMPRISING 3 TRANSFORMER AND 1 TRANSMISSION LINE FIELD



**HPP GALISTE
LAYOUT**

