

„ PROJECT VARDAR VALLEY“



Prepared by: Department of Development and Investments

Skopje, 2016

INTRODUCTION



The area of the Vardar Valley has been the focus of interest in its current development and particularly in the last two decades. These interests amplify depending on the specific geopolitical and economic situation of our country, and various aspects of integration of the interest to landscape this area into the development plans at the regional level, as well as the specific interests of developing the economy as a whole.

The complex landscaping of the Vardar Valley will include:

- Construction of facilities for energy use;
- Construction of systems for the development of agriculture;
- Construction of systems for the development of tourism industry, sport and recreation;

Hydro-energy utilization of the river Vardar has been studied in several phases.

So far, some basic designs have been prepared on individual hydro-technical facilities. Simultaneously, shorter stretches of the main stream of the Vardar or its tributaries have been handled. There are also some considerations regarding the general solution of the river Vardar's entire basin.

The Vardar Valley Programme envisages energy use of the Vardar stream and its most important tributaries.

On the Vardar stream, which means the water-flow stretch from Skopje to the border with Greece, which is 200 km long, 12 hydro-power plants have been planned for construction, of which the major ones are: Veles HPP with a production of 300 million kWh and Gradec HPP with 257 million kWh. Other smaller hydro-power plants have been deployed in cascades down the river stream, with a production of 60 to 130 million kWh, depending on the location and flow [7].

These smaller dams together with their hydro-power plants have been envisaged to be embedded in the riverbed due to their low height, with minimum excavation for construction work, which is a cost-effective and functional solution. The river will retain its natural riverbed shaped with protective embankments in the form of channels. The landscaping of the river in this way will also satisfy the environmental requirements, since its natural basin and level will be retained to the highest possible extent, as well as the groundwater regime, which protects the fertile agricultural land.

HPP VELES

Description of project

HPP Veles is planned to be constructed in the middle flow of Vardar river between Skopje and Veles in the valley part of the river, more precisely between villages Zelenikovo and Basino.

Storage "Veles" entirely overflows railway Skopje –Veles at location from railway station Zelenikovo until dam and therefore there is necessity of dislocation of railway between stations Zelenikovo and Veles.

Energy utilization of location Taor-Veles of HPP "Veles" requires dislocation of railway and at the same time does not refer to already resolved water management problems in Skopje Valley.

- Free flow of Vardar river waters is provided through Skopje Valley which is achieved with realization of project for regulation of Vardar river as well as unconsidered outflow of underground waters, drainage of Skopje field.
- Optimal energy utilization of available energy potential of Vardar river at location Taor-Veles.
- Creating conditions for water supply of industry and city of Veles with necessary water.
- Creating of conditions for more optimal use of water downstream of Veles as well as due to necessities of water management and energetics itself.
- Radical resolving of railway traffic in valley downstream of Taor with foreseen perspective possibility for regular resolving of Veles crossroad and railway station Veles.
- Contribution for providing of conditions for development of tourism nearby Skopje.

Table 1 Main characteristics of HPP "Veles"

Dam height	59,50 m
Length of dam crest	135,00 m
Width of dam crest	6,00 m
Useful storage volume	64,00 x 10 ⁶ m ³
Installed flow	195,00 m ³ /s
Net fall	53,50 m
Turbine type	Francis
Number of units	3
Installed capacity per unit	31,00 MW
Calculated installed capacity	93,10 MW
Average annual flow of site	76,40 m ³ /s
Average annual generation	310 GWh
Construction period	6 years
Dislocation of railway	30 km
Total cost of project	157,7 million Euros

HPP GRADEC

Description of project

HPP "Gradec" is predicted to be constructed in the bed of river Vardar, downstream of Udiovo village (30.4 km from the Macedonia-Greek border) in order to be used energy potential of Vardar river at location of Udovo village to Demir Kapija with one additional energy level.

Regarding adopted disposition of HPP "Gradec" overflow gravity dam and powerhouse building are situated nearby in middle of Vardar River valley and sideways towards banks are planned concrete gravity parts of dam. This solution is adopted due to the fact that enables construction of overflow gravity dam and powerhouse building in I phase almost in dry and fastest start at the beginning of construction simultaneously with preparation of sheet piling from I phase and simultaneously with dislocation of railway at that crossroad.

Table 2 Main characteristics of HPP „Gradec“

Dam height	33,00 m
Length of dam crest	520,00 m
Width of dam crest	10,00 m
Useful storage volume	43,00 x 10 ⁶ m ³
Installed flow	240,00 m ³ /s
Net fall	27,15 m
Turbine type	Каплан
Number of units	2
Installed capacity per unit	28,80 MW
Calculated installed capacity	55,20 MW
Average annual flow of site	141,20 m ³ /s
Average annual generation	243 GWh
Construction period	6 years
Dislocation of railway	22 km
Total cost of project	174,5 Million Euros

RUN-OF-RIVER HPP VARDARSKA DOLINA

HPP in Vardarska Dolina is planned to be constructed in order to be utilized the entire potential water of Vardar river.


Table 3 Technical characteristics of run-of-river HPP

	Dam height (m)	Length of dam crest (m)	Width of dam crest (m)	Installed flow (m³/s)	Net fall (m)	Turbine type	Number of units
BABUNA	25,00	171,00	25,50	240	8,50	bulb	2
ZGROPOLCI	24,50	186,00	25,50	240	8,30	bulb	2
GRADSKO	24,50	166,00	25,50	240	8,30	bulb	2
KUKURECANI	24,50	150,00	25,50	240	8,30	bulb	2
KRIVOLAK	27,20	185,00	25,00	240	8,30	bulb	2
DUBROVO	27,20	224,50	25,00	240	8,30	bulb	2
DEMIR KAPIJA	29,65	193,50	43,50	240	12,00	bulb	2
MILETKOVO	24,75	200,50	24,70	240	8,20	bulb	2
GAVATO	24,00	199,00	24,90	240	8,20	bulb	2
GEVGELIJA	24,00	190,00	25,50	240	8,30	bulb	2

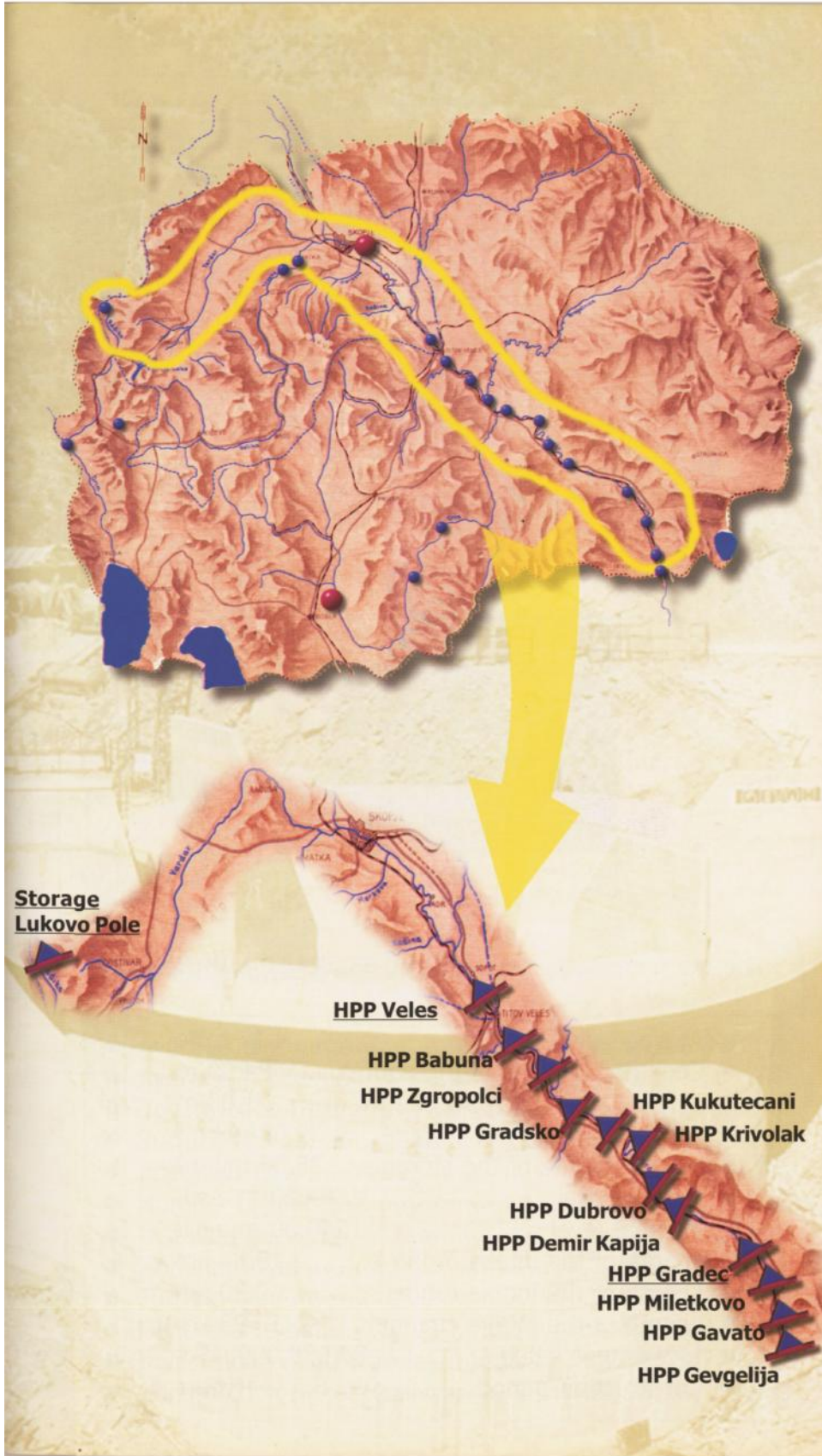
	Installed capacity per unit (MW)	Calculated installed capacity (MW)	Average annual flow of site (m³/s)	Average annual generation (MWh)	Investment of HPP project (M €)
BABUNA	9,0	17,3	80.5	51957	39.5
ZGROPOLCI	8,80	16,9	79.9	50347	66
GRADSKO	8,80	16,9	109.1	63722	65.9
KUKURECANI	8,80	16,9	136.4	77541	62.4
KRIVOLAK	8,80	16,9	136.5	77603	64.8
DUBROVO	8,80	16,9	136.3	77478	85.8
DEMIR KAPIJA	12,70	24,4	137.7	112107	130.2
MILETKOVO	8,70	16,70	141.9	79685	91.2
GAVATO	8,70	16,70	145.7	81841	112.7
GEVGELIJA	8,80	16,60	148.0	84148	78.9
ВКУПНО	91,90	176,20		756429	797,4

INVESTMENT GOALS

A key goal is to increase Macedonia's own electricity production through the use of water resources, while through the construction of hydro-power plants on the river Vardar, Macedonia seeks to regulate the water potential regime and use, spatial planning, protection of goods, the social aspects and exploitation of water resources. By the construction of hydro-power plants on the river Vardar, the following objectives have been set:

- Change in electricity generation structure by increasing the proportion of hydro-energy or energy generated from renewable sources.
 - Minimize the impact on the environment through the use of water as a renewable and efficient energy source.
 - Reduce energy dependence of the country through the construction of hydro-power plants as domestic energy sources.
 - Improve flood protection through the regulation of watercourses.
 - Prevent the lowering of underground water level in the entire area.
 - Promote national development through the use of water potential as an effective source of electricity production.
- 

Picture 1 HES Vardar Valley



WATER BASIN OF RIVER VARDAR

Picture 2 Longitudinal cross-section HES Vardar Valley

