

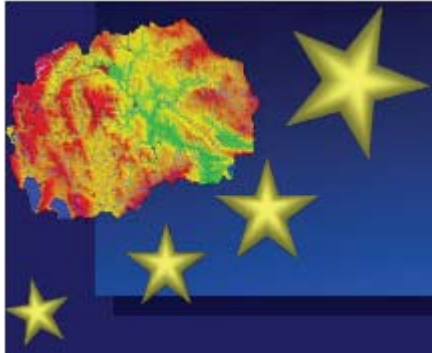
**SMALL HYDROPOWER PLANTS  
IN REPUBLIC OF MACEDONIA  
- SITUATION AND POSSIBILITIES -**

*Sotir PANOVSKI*

*Gordana JANEVSKA*

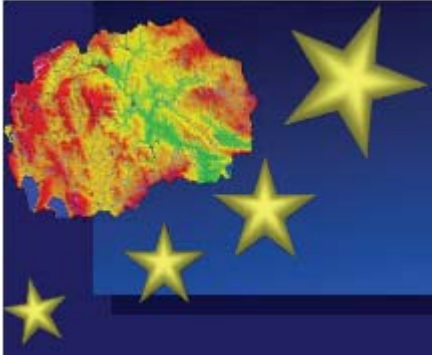
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# *SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -*

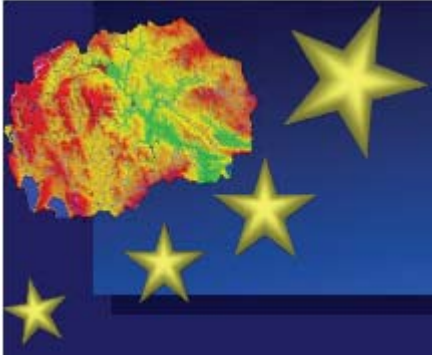
- *REPUBLIC OF MACEDONIA  
- the position*
- *ELECTROENERGETICS*
- *HYDROENERGETICS*
- *SMALL HYDROPOWER PLANTS*



## *SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -*

### *OBJECTIVES*

- *The present situation, possibilities, needs and conditions for building and investing into SHP in Republic of Macedonia have been described*
- *The hydro potential: technically available hydro potential and also the hydro potential used with small and large HP have been given through the concrete data*
- *The present existence of a relatively small number of small hydropower plants has been pointed out, but also the potential of the 406 noted possible locations for future SHP has been noted*



*SMALL HYDROPOWER PLANTS IN  
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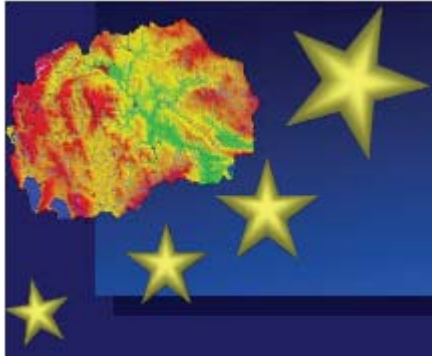
*REPUBLIC OF MACEDONIA*

*- THE POSITION -*

*Republic of Macedonia takes place on the Balkan Peninsula. It is a small country with 25.713 km<sup>2</sup> and 2 million inhabitants. The mountain area with numerous rivers and continental climate are predominant.*

*Macedonia, as an Eastern European country, is into transition process since 1989 as a consequence of the political and economic changes within the society.*

*At the present Republic of Macedonia is a country candidate for membership in the EU.*



## *SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -*

### *ELECTROENERGETICS*

- ❖ 60 % Thermal and Hydro Power Plants*
- ❖ 40 % Other energy sources,  
such as: oil, gas and fire-wood*

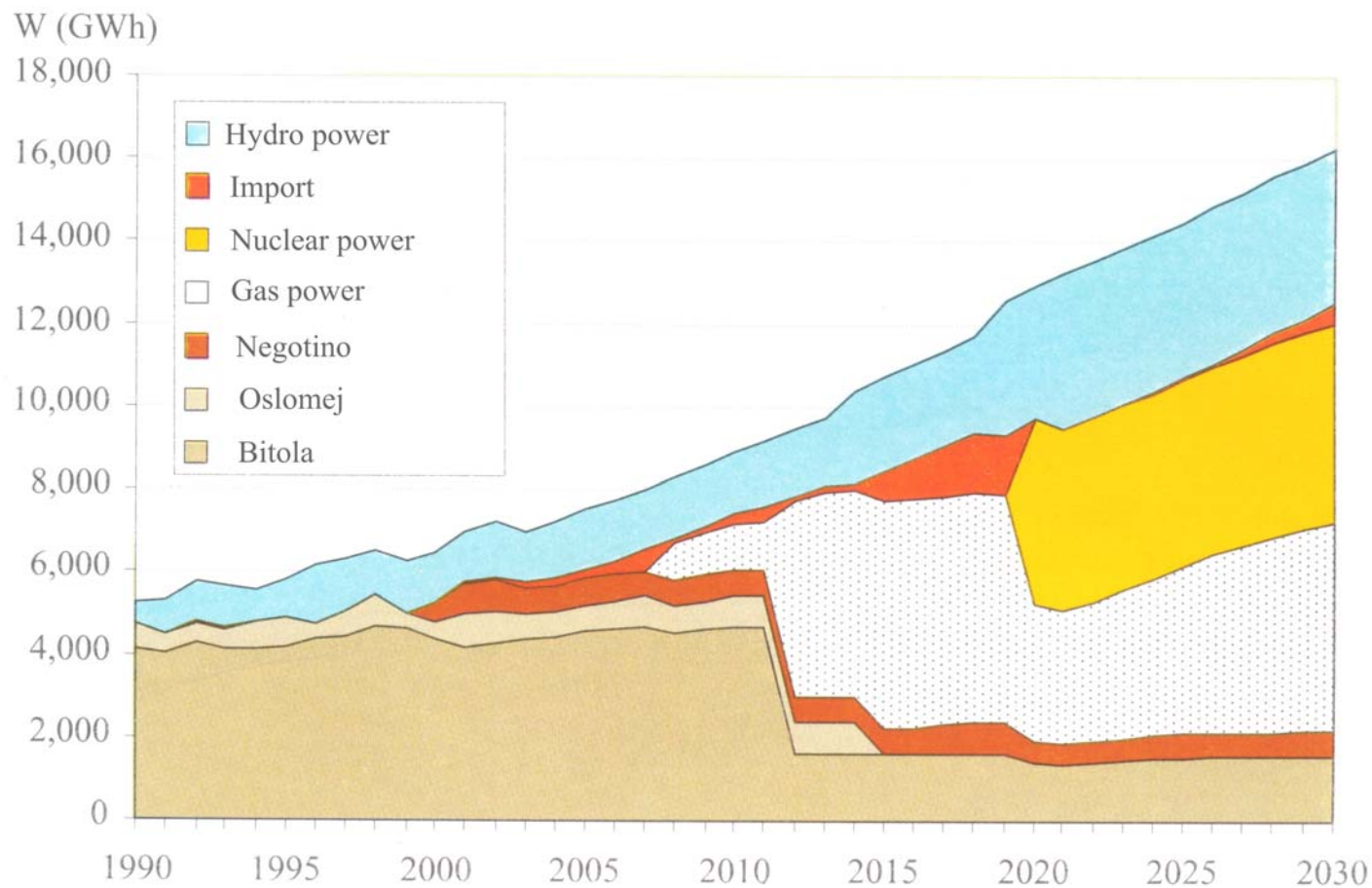
*Table 1*

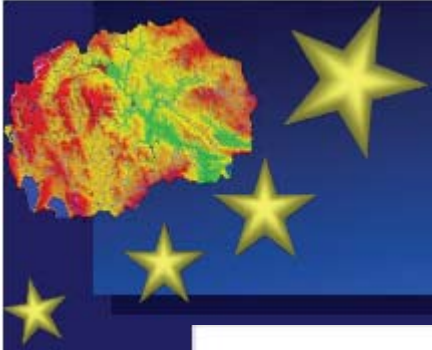
	Thermal Power Plants		Hydro Power Plants		Total	
<b>Installed capacity [MW]</b>	<b>1010</b>	<b>70 %</b>	<b>434</b>	<b>30%</b>	<b>1443, 8</b>	<b>100%</b>
<b>Electricity delivered into network [GWh per year]</b>	<b>4864</b>	<b>87%</b>	<b>755</b>	<b>13%</b>	<b>5619</b>	<b>100%</b>



# SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -

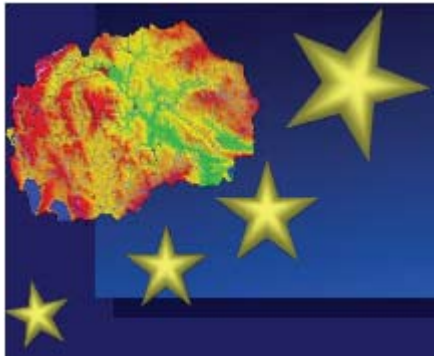
## *Electricity production from all sources until 2030*





# SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -



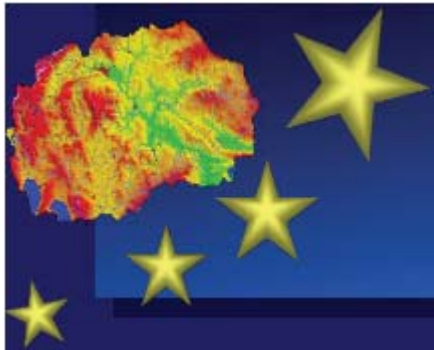


***SMALL HYDROPOWER PLANTS IN  
REPUBLIC OF MACEDONIA  
- SITUATION AND POSSIBILITIES -***

***HYDROENERGETICS***

*Table 3*

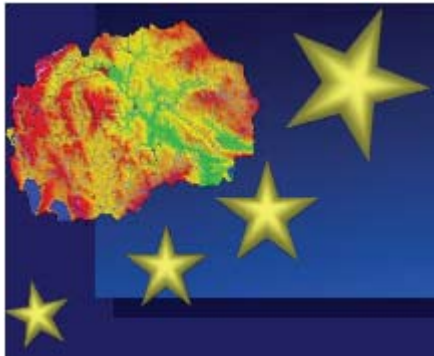
<b>Total water potential</b>		<b>Technically used water potential</b>		<b>Electricity production in HPP</b>	
<b>GWh per year</b>	<b>%</b>	<b>GWh per year</b>	<b>%</b>	<b>GWh per year</b>	<b>%</b>
<b>8913</b>	<b>100</b>	<b>6436</b>	<b>72,2</b>	<b>1000</b>	<b>15,5</b>



***SMALL HYDROPOWER PLANTS IN  
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*Table 4*

<b>Name</b>	<b>Started year</b>	<b>Power [MW]</b>	<b>Annual energy [GWh per year]</b>
<b>Vrben</b>	<b>1959</b>	<b>12,8</b>	<b>38,9</b>
<b>Vrutok</b>	<b>1957</b>	<b>150</b>	<b>317,3</b>
<b>Raven</b>	<b>1959</b>	<b>19,2</b>	<b>38,4</b>
<b>Globocica</b>	<b>1965</b>	<b>42</b>	<b>164,6</b>
<b>Spilje</b>	<b>1969</b>	<b>84</b>	<b>241,4</b>
<b>Tikves</b>	<b>1968</b>	<b>92</b>	<b>135,6</b>
<b>Kalimanci</b>	<b>1970</b>	<b>12,8</b>	<b>29</b>
<b>Kozjak</b>	<b>2005</b>	<b>82,5</b>	<b>156</b>
<b>Small HP</b>		<b>30,2</b>	<b>63,8</b>
<b>Total</b>		<b>495,3</b>	<b>1121,2</b>



## *SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -*

*Table 5*

<b>Name</b>	<b>Power [MW]</b>	<b>Annual production [GWh per year]</b>	<b>Investments [M \$]</b>
<b>St. Petka</b>	<b>33,2</b>	<b>53</b>	<b>39,4</b>
<b>Boskov most</b>	<b>45</b>	<b>155,5</b>	<b>54,6</b>
<b>Lukovo pole</b>	<b>30</b>	<b>115</b>	<b>35,6</b>
<b>Galiste</b>	<b>193,5</b>	<b>257</b>	<b>218,3</b>
<b>Cebren</b>	<b>253,8</b>	<b>292</b>	<b>337,1</b>
<b>Veles</b>	<b>93</b>	<b>301</b>	<b>251,1</b>
<b>Gradec</b>	<b>54,6</b>	<b>252,4</b>	<b>156,8</b>
<b>Total</b>	<b>703,1</b>	<b>1425,9</b>	<b>1092,9</b>



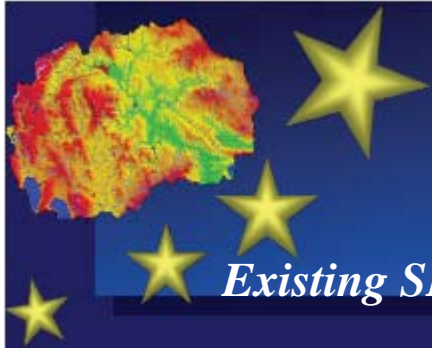
## ***SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -***

### **SMALL HYDROPOWER PLANTS**

- ***1927*** - *The first HP with installed capacity of 1,76 MW has been started*
- ***till 1953*** - *The period of building of small and micro HP (around 50)*
- ***1953*** - *The process of building of SHP was stopped and the process of building of large HPP was started*
- ***1957*** - *The first large HP (150 MW) has been started*
- ***1957*** - *A lot of SHP were abandoned*

#### ***The present capacities of large and small HPP***

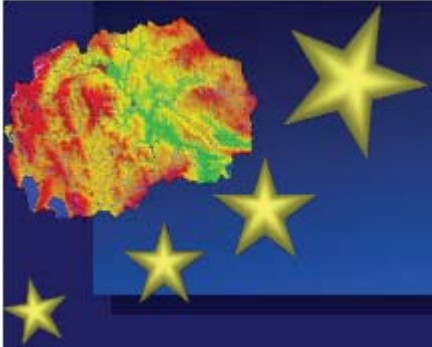
	Power		Annual production	
	MW	%	GWh per year	%
<b>Large HPP</b>	<b>495,3</b>	<b>94</b>	<b>1121,2</b>	<b>95</b>
<b>Small HPP</b>	<b>30,2</b>	<b>6</b>	<b>63,8</b>	<b>5</b>
<b>Total</b>	<b>525,5</b>	<b>100</b>	<b>1185</b>	<b>100</b>



## *SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -*

### *Existing SHPP in Republic of Macedonia*

	Name	Started year	Aggregates (No.)	Nominal power [MW]
1	Pena	1927	2	1,76
2	Matka	1938	3	4,20
3	Zrnovci	1950	2	1,26
4	Pesocani	1951	2	2,88
5	Sapuncica	1952	2	2,80
6	Dosnica	1953	3	4,62
7	Belica	1989	1	0,25
8	Turija	1985	2	2,00
9	Strezevo			
	Strezevo	1992	3	2,4
	Bioloski min.	1994	1	0,132
	Filternica	1997	1	0,38
	Dovledjik	1997	1	0,46
10	Popova Sapka (4 HPP)	1993	4	5,2
11	Lukar Kavadarci (4 HPP)	2003	4	1,21



# *SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -*



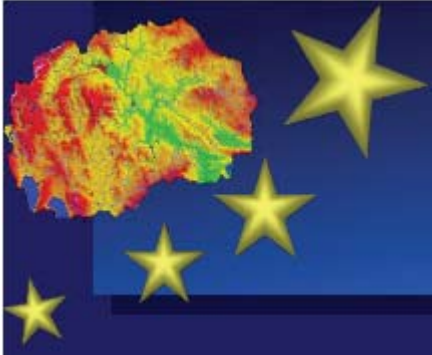


## *SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -*

### *SMALL HYDROPOWER PLANTS*

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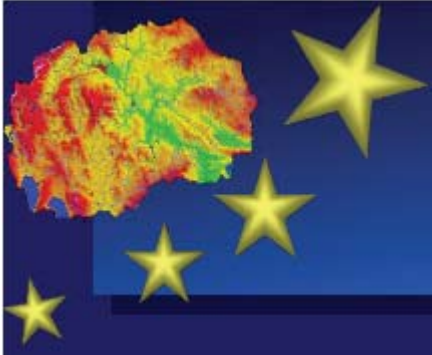
- *1982 - “Study about possible SHP in the Republic of Macedonia”  
(up to 5 MW )*
  - ❑ *406 SHPP*
  - ❑ *258 MW*
  - ❑ *1.094 GWh*
  
- *Until the day very little of the proposed Study is completed*
  - ❑ *not a single SHPP as a independent object (on a river) has been build as proposed in the Study, although a few SHP have been build as part of a plantation for watering and water supply in general*



*SMALL HYDROPOWER PLANTS IN  
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*LIMITATION FACTORS IN BUILDING OF SHP IN  
REPUBLIC OF MACEDONIA*

- 1. Weak hydrological base*
- 2. Thin techno-economic documentation*
- 3. Missing good examples and insufficient information*
- 4. Weak national policy in the field of building of SHP*
- 5. Poor national legislation*



## *SMALL HYDROPOWER PLANTS IN REPUBLIC OF MACEDONIA - SITUATION AND POSSIBILITIES -*

### *CONCLUSION*

*In Republic of Macedonia , a relatively small country, there is a significant unexploited hydro-energetic potential.*

*SHP are significant potential into providing the future energy needs*

*There are limiting factors to building SHP in RM*

*It is expected that the policy for building SHP will be more intensive in the future.*

*It is very soon expected that there will be an international public advertisement for concession on some locations for SHP under the conditions preparing in cooperation with the International Bank for Reconstruction and Development - World Bank Group.*