HYDROENERGY in MACEDONIA

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INTRODUCTION

- Macedonia, as an Eastern European country, is into transition process since 1989 as a consequence of the political and economic changes within the society.
- Future energetic solutions and development will also need to account for the continuous transition period and take on board such experiences of the developed countries, especially the positive experiences of the small EU countries.
- Nowadays the electricity import is significance and it is to expect that this trend will continue.

HYDROENERGETICS

HYDROPOWER PLANTS AS PRODUCERS OF RENEWABLE ENERGY

- In terms of HPP, until recently, only small HPP were considered as renewable energy, not only here but in Europe and beyond
- According to the ESHA the recommended limit is HPP up to 10 MW to be considered as small HPP.
- Lately, the limit up to 10 MW has been practiced for small hydro in RM (Ministry of Economy, etc...)
- Facilities that use renewable sources for electricity generation are : hydro power plants, wind power plants, biomass power plants, biogas power plants, solar power plants and geothermal power plants
- The separation of small and large hydropower plants in terms of renewable energy sources is past, i.e. hydro plants that use renewable sources of energy include all hydro power plants, the small once as well as the large

HYDROENERGETICS

CURRENT GENERAL SITUATION

Existing HPP in RM - Technical data

HPP	Basin	Aggreg. (No.)	Q_{inst}/aggr. (m^3/s)	H (m)	V ($10^6 m^3$)	P_{inst} (MW)	W_{year} (GWh)	Started year
Vrben	Mavrovo	2	4,6	193	0	12,8	45	1957/1973
Vrutok	Mavrovo	4	9	574	277	172,0	390	1959/1973
Raven	Mavrovo	3	10,6	66	0	21,6	53	1959
Tikvesh	River Crna	4	36	100	272	116,0	184	1966/1981
Kalimanci	Bregalnica	2	9			13,8	17	2006
Globochica	Crn Drim	2	27	110,9	228	42,0	213	1965
Shpilje	Crn Drim	3	36	95	212	84,0	300	1969
Kozjak*	Treska	2	50	100	260	80,0	150	2004
Matka**	Treska	2	20	28	1,1	9,6	40	2009
Total						551,8	1392	

HYDROENERGETICS

CURRENT GENERAL SITUATION

The basic technical characteristics of large HPP candidates for investments

	Basin	P_{inst} MW	W_{year} GWh	Investments M €	Construction period year
St. Petka	Treska	36	60		
Boskov Most	Radika	68,2	117	70	4
Lukovo Pole	Mavrovo	5	163	45	4
Galishte	River Crna	193,5	264	200	7
Chebren	River Crna	333	340/840	319	7
Gradec	Vardar	54,6	252	157	7
Veles	Vardar	93,0	300	251	7
10 HPP Vardar Valley	Vardar	176,8	784	486	7
Total		960	2280/2780	1528	

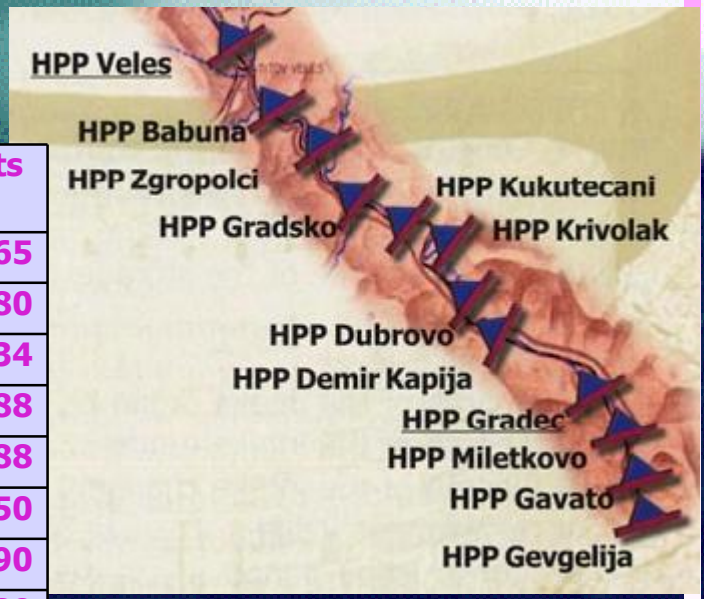
Hydro energy in Republic of Macedonia

HYDROENERGETICS

CURRENT GENERAL SITUATION

Candidates of 10 unified HPP on the Vardar River

HPP	Q_{inst} (m^3/s)	H (m)	P_{inst} (MW)	W_{year} (GWh)	Investments M €
Babuna	240	8,5	17	56,9	36,65
Zgropolci	240	8,5	17	55,5	39,80
Gradsko	240	8,3	17	66,6	44,34
Kukuricani	240	8,3	17	79,5	43,88
Krivolak	240	8,3	17	80,0	43,88
Dubrovo	240	8,3	17	80,2	52,50
D.Kapija	240	12	24	116,4	61,90
Miletkovo	240	8,2	17	80,3	53,89
Gjavato	240	8,2	17	83,2	60,66
Gevgelija	240	8,3	17	85,1	48,50
Total			177	783,7	486,01



HYDROENERGETICS - CURRENT GENERAL SITUATION

Existing small HPP in RM - Technical data

SHPP	Q_{inst} (m^3/s)	P_{inst} (MW)	W_{year} (GWh)
Pena	2 x 2	3,3	9,43
Zrnovci	3 x 0,4	1,4	4,19
Pesocani	2 x 0,6	2,7	10,29
Sapuncica	2 x 0,4	2,9	9,96
Doshnica	3 x 0,7	4,1	15,02
Turija	2 x 2,3	2,2	5,20
Modric	1 x 0,4	0,2	0,43
Babuna	3 x 1,24	0,7	2,70
Belica	1 x 1	0,3	1,00
Glaznja	/	2,1	/
Popova Sapka	4 x 0,6	4,8	18,00
Strezevo 1	/	2,4	/
Strezevo 2	/	0,1	/
Strezevo 3	/	0,38	/
Strezevo 4	/	0,46	/
Lukar (Kavadarci) 4 SHPP	/	1,21	/
Dabniste	/	0,032	/
Total		29,282	76,2

Small HPP candidates for investments

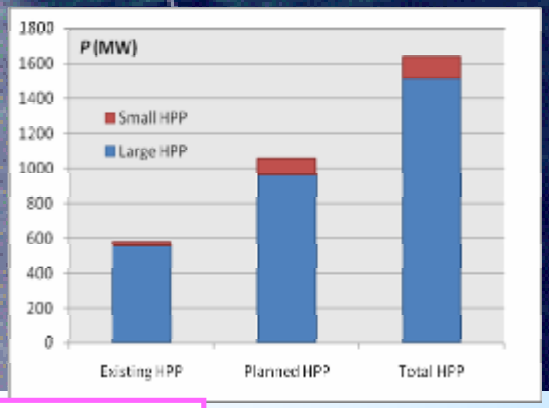
SHPP	P_{inst} MW	W_{year} GWh
Tender from ME	93	245
HS Zletovica	7,5	22
Total	**100,5**	**267**

HYDROENERGETICS

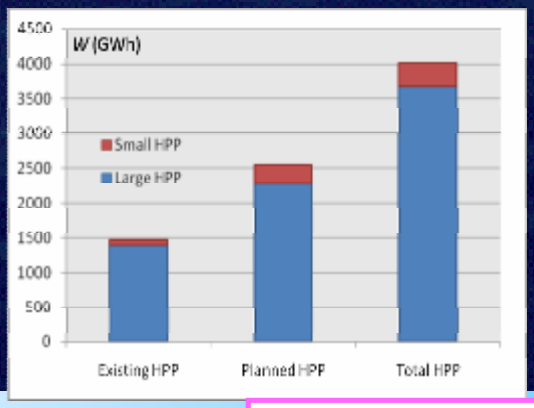
CURRENT GENERAL SITUATION

Comparison of existing and planned hydroelectric potential

HPP	Existing		Planned		Total	
	P_{ins} (MW)	W_{year} (GWh)	P_{ins} (MW)	W_{year} (GWh)	P_{ins} (MW)	W_{year} (GWh)
Large	552	1392	960	2280	1512	3672
Small	27	76	100	267	127	343
Total	579	1468	1060	2547	1639	4015



Installed capacities



Average annual production

HYDROENERGETICS

CURRENT GENERAL SITUATION

- **Feed in tariffs for the electricity produced and furnished from the SHPP**

Unit	Monthly furnished electricity [kWh]	Annual furnished electricity [kWh]	Feed in tariffs [€ cents/kWh]
I	1-85000	1-1020000	12,00
II	85001-170000	1020001 -2040000	8,00
III	170001-350000	2040001-4200000	6,00
IV	350001-700000	4200001-8400000	5,00
V	above 700001	above 8400001	4,50

HYDROENERGETICS

CURRENT GENERAL SITUATION

Planned utilization of hydro energy in Republic of Macedonia by 2020 and by 2030

HPP	P_{inst}	Annual production (GWh)		
	(MW)	UL	LL	PS
St. Petka	36	60	60	60
Boskov Most	68	117	117	117
Lukovo Pole	5	163	163	163
Galishte	193	264	264	264
Chebren**	333	340	340*	340
Gradec	55	252	252*	252*
2020 Total	690; 302; 635	**1196**	**604**	**944**
Veles	93	300	300	300
10 HPP Vardar Valley	177	784	784	784
2030 Total	**960**	**2280**	**2280**	**2280**

CONCLUSION

- All hydro power plants (large, as well as small) belong to renewable hydro energy sources .
- The limit for small HPP (10 MW) is in function of application the feed-in tariffs for electricity generation from small HPP
- In Macedonia there is considerable hydro energy potential, which is estimated to be around 5600 GWh technically usable hydro potential. Today, it is used around 1470 GWh which is only about 26% from this potential.
- It can be expected that Macedonia by 2020 can realistically achieve 21% participation of renewables .
- The Strategy for utilization of renewable energy sources in Macedonia predicts the participation of HPP electricity generation in the final energy consumption in the limits 3430 - 4410 GWh from large HPP and in the limits 510 - 710 GWh from small HPP by 2030.