SECURITY OF SUPPLY STATEMENT OF THE REPUBLIC OF MONTENEGRO

Prepared by the Ministry for Economic Development

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1. LEGAL REGULATION OF SECURITY OF SUPPLY

Energy sector of Montenegro has been characterized by the reform changes in major market, economic, legislative and institutional aspects of energy sector activities, along with the changes related to technological development and environmental impact. The reform began in June 2003 with the adoption of the new Energy Law of the following main characteristics:

- The Law regulates generation, transmission, distribution and supply of electricity in the market.
- Energy sector activities are activities of public interest.
- The objectives of the Law are to ensure a safe, secure, reliable quantity and quality supply of energy at fair prices, taking into account environmental protection, tariff customer protection, etc.
- Competencies of the Ministry in the energy sector include promoting new energy-related technologies use.
- The Energy Regulatory Agency was established as an independent and functionally independent and non-profit organization to carry out its public authorisations in accordance with the mentioned Law. Main objectives are:
    - to ensure reliable, safe and environmentally sound supply of energy to the tariff customers of Montenegro at fair prices, and
    - to promote safety, competency and efficiency on the part of energy undertakings.
- In addition, the Law (Article 39) regulates events of sudden crises in the energy market caused by *Force Majeure*, where the physical safety of people, installations or network is jeopardized, and where the Government of the Republic of Montenegro and the Agency are entitled to introduce temporary measures, pursuant to the provisions of this Law and Secondary Legislation.
- Authorisations issued by the Energy Regulatory Agency are regulated by this Law (Article 40).

2. ELECTRICITY

Similar to other countries in the region, Montenegro has high foreign trade deficit of 7.3% GDP (the figure is 9.32% in average for the region of South East Europe). Such foreign trade deficit is significantly influenced by Montenegro's high energy dependence (energy sources import). Bearing in mind such trends, significance of energy self-generation development and attracting foreign investments into energy sector of Montenegro is inasmuch larger, given the fact that it represents one of the most efficient mechanisms for both growth stimulation and balance of payments deficit reduction.

Gross energy consumption is 7.290 kWh per capita, which nearly equals EU-15 consumption and outnumbers by more than two times consumption of the countries in the region.

Export of 5,48 PJ in 2004 is almost five times smaller than import and relates to: energy - 4,87 PJ (88,8%), lignite - 0,49 PJ (8,9%) and brown coal - 0,12 PJ (2,2%).

Due to large electricity deficit in Montenegro and impossibility of construction of generation facilities with enough capacities to cover the deficit in a short period of time, there is a need for import of electric power from the neighbouring countries. Dependence upon import will further grow until 2010 at least, or more exactly until 2011. At least 4 years are needed for construction of thermal power plants or hydro power plants, taking into account the start of construction and ultimate start of operations. And so, dependence from import will reach the level amounting to 50% until 2011. Up to date, analyses forecast electricity deficit in the forthcoming period, which will certainly be reflected both in opportunities and in prices of imported electric energy in Montenegro.

In overall energy balance sheet of Montenegro, hydro energy, oil derivates, coal, wood and waste materials are included. A solid diversification of supply has been created since the three main energy forms participate approximately on equal levels in supplying. In the period from 1997 until 2004 the following may be seen: increase of total energy consumption with approximate growth rate amounting 5.5% and increase of import with annual growth rate amounting 4.3% (Figure 1).

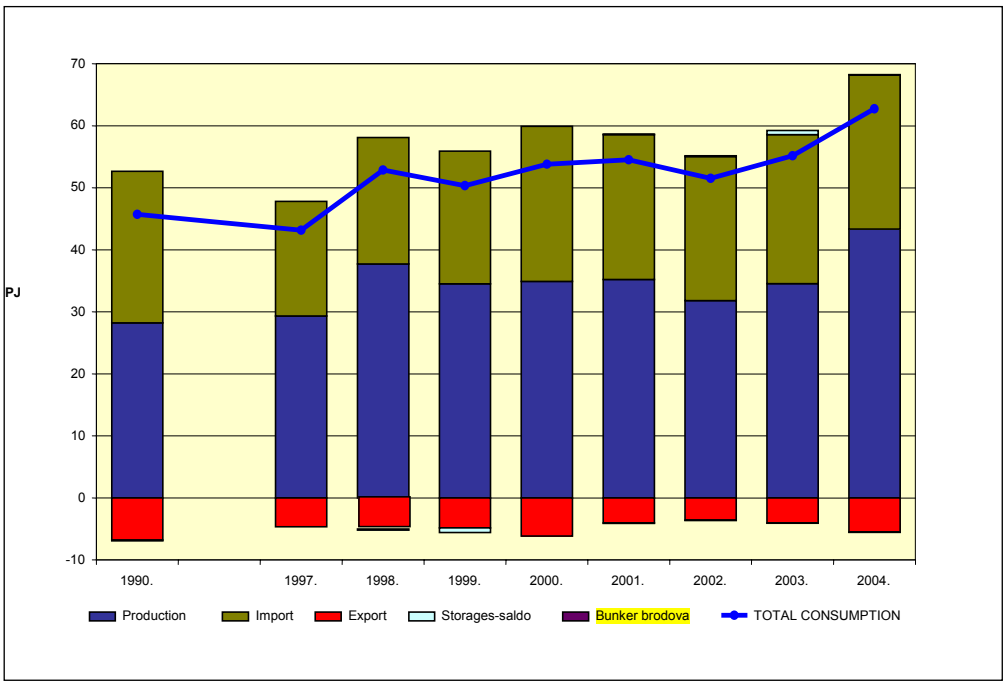

***FIGURE 1**: Total energy balance in Montenegro (1990, 1997-2004)*

2.1. ENERGY INFRASTRUCTURE IN MONTENEGRO

In the power system of Montenegro there are three large production units in operation: HPP Perućica and HPP Piva along with TPP Pljevlja. Within the system there are also 7 smaller HPPs, but their contribution in regards to capacity and production is relatively small. Within the system, the total installed capacity of the plants amounts to 868 MW, while the net power plant capacity amounts to 849 MW. Hydro power plants` part in the installed capacity amounts to 31% while their part in the produced energy amounts to 61%. Contributions of certain power plants in installed capacity and generated energy in the period from 2002 until 2004 are shown in Figure 2 (ratio for the period from 2002 until 2004), along with expected oscillations depending on weather circumstances.

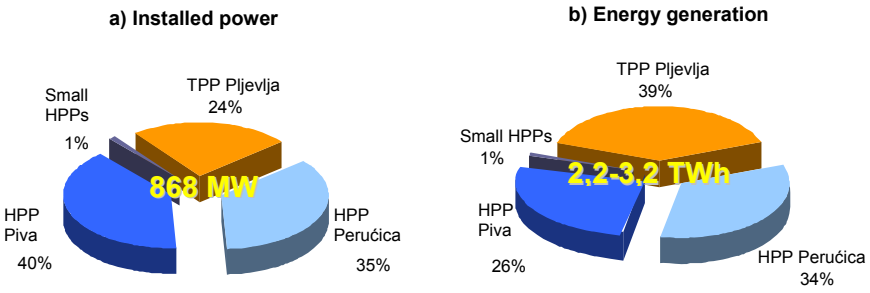

FIGURE 2: Electric power plants quota in total installed power and generated energy for the period 2002 - 2004

2.2. BALANCE OF GENERATION, EXCHANGES, IMPORT, EXPORT AND CONSUMPTION OF ELECTRICITY

Energy balance has been carried out according to the analysis of energy situation, as well as with respect to major energy and technical characteristics, planning criteria for generation and consumption, identified needs of consumers, joint liabilities of Montenegrin and Serbian Power Utilities in accordance with their Agreement on long-term business and technical cooperation (DTPS), as well as the invited bids for import of energy insufficient in quantity.

Table 1 gives the balance of elements attained in 2005, estimate of achievement in 2006 and 2007 plan with relevant comparisons.

Table 1: *Achieved balance elements for 2005, estimation of achievements for 2006 and a plan for 2007 in (GW/h)*

ELEMENTS OF BALANCE SHEET	Achieved 2005. g.	Est. of achiev. 2006. g.	Plan 2007. g.	INDEX (3)/(2)	INDEX (4)/(3)
1	2	3	4	5	6
1. GROSS PRODUCTION	**2747,8**	**2949**	**2520**	**107,3**	**85,5**
1.1. Production in HPP, net power capacity	1857,4	1876	1703	101,0	90,8
HPP "Perućica"	1016,2	946	920	93,1	97,3
HPP "Piva"	818,3	910	762	111,2	83,7
Distributive HE	23,0	20	21	87,1	105,0
1.2. Production in TPP "Pljevlja"- net power capacity	890,4	1073	817	120,5	76,1
2. SUPPLY FROM EPS-a	**1271,3**	**1199,9**	**1076**	**94,4**	**89,7**
according to the Contract	1066,0	1075,5	1076	100,9	100,0
other supply	205,3	124,4	0	60,6	0,0
3. I M P O R T	**1587,1**	**1600**	**1966**	**100,8**	**122,9**
Importer EPCG	913,3	900	1235	98,5	137,2
Importer KAP	614,1	700	731	114,0	104,4
Importer Željezara (Steel Plant)	59,8	0	0	0,0	
4. DEVIATION – taking over from EPS	**17,5**	**15**	**0**	**86,0**	**0,0**
5. DELIVERY TO EPS	1024,5	1005	762	98,1	75,8
according to the Contract	818,3	910	762	111,2	83,7
other deliveries	206,3	95	0	46,1	0,0
6. E X P O R T	**44,2**	**44**	**0**	**99,5**	**0,0**
7. DEVIATION – bestowal to EPS	**11,6**	**2**	**0**	**17,3**	**0,0**
8. AVAILABLE FOR CONSUMPTION (1+2+3+4) - (5+6+7)	**4543,4**	**4712,9**	**4800**	**103,7**	**101,8**
9. GROSS CONSUMPTION	**4543,4**	**4712,9**	**4800**	**103,7**	**101,8**
9.1. Direct consumers	**2058,3**	**2129,9**	**2153**	**103,5**	**101,1**
Aluminum Plant	1897,0	1918,5	1936	101,1	100,9
Railway	138,5	187,6	192	135,5	102,3
P.E. "Željeznice Crne Gore"	22,8	23,8	25	104,4	105,0
9.2. Distribution consumption-gross	**2309,8**	**2410**	**2464**	**104,3**	**102,2**
Net consumption	1710,2	1769	1930	103,4	109,1
Losses in distribution network	599,6	641	534	106,9	83,3
9.3. Losses in transmission	**175,4**	**173**	**183**	**98,6**	**105,8**

2.3. NET GENERATING CAPACITIES PLAN BY POWER PLANTS

Gross energy production in Montenegro in 2007 has been estimated to 2.520 GWh, which is 14,5% less than the estimate of achievement for 2006 (the estimation included energy generated by electric power plants connected to the transmission network and distribution plants (leaving out self-consumption of generated energy). The reason for reduction of 2007 energy generation plan as compared to 2006, is planned four-month capital repair of a turbine in TPP Pljevlja. Index of planned net generating capacities by plant units and total net generation capacity, as compared to the plan and estimate of achievement for 2006, is given in Table 2.

Table 2: *Index of planned net generating capacities by plant units*

	Power Plant	Plan for 2007	Plan for 2006	Estimate Of Achievement 2006	Index 2/3 %	Index 2/4 %
	1	2	3	4	5	6
1	HPP “Perucica”	920	890	946	103,4	97,3
2	HPP “Piva”	762	762	910	100,0	83,7
3	Small HPPs	21	21	20	100	105,0
4	HPP in total (1+2+3)	1703	1673	1876	101,8	90,8
5	TPP “Pljevlja”	817	1073	1073	76,1	76,1
6	TOTAL (4+5)	2520	2746	2949	91,8	85,5

Planned generation structure for 2007 by power plants is given in Figure 3.

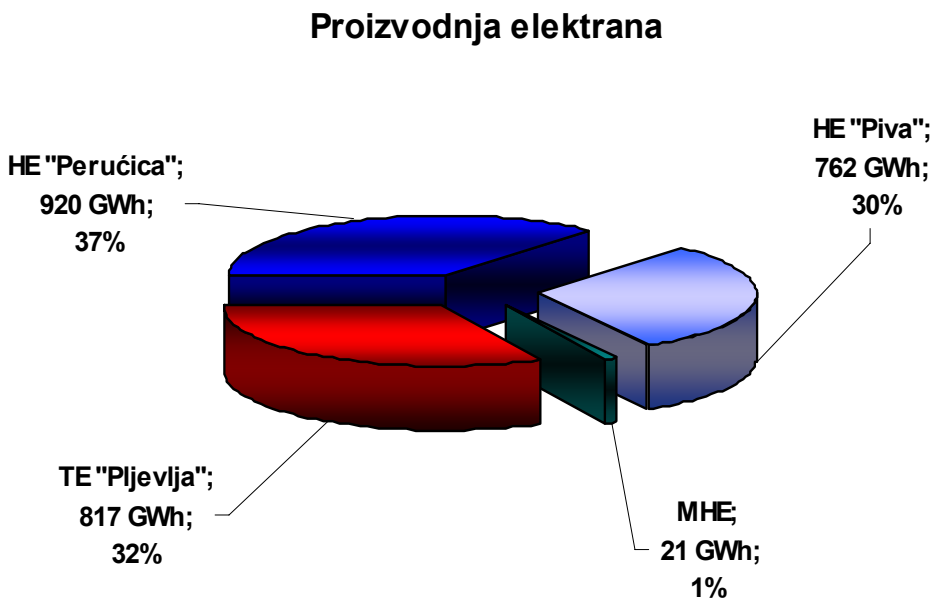

Figure 3: *Planned 2007 generation structure by power plants*

Generation plans for 2003 – 2005 period, 2006 estimate and 2007 generation plan are shown in Figure 4.

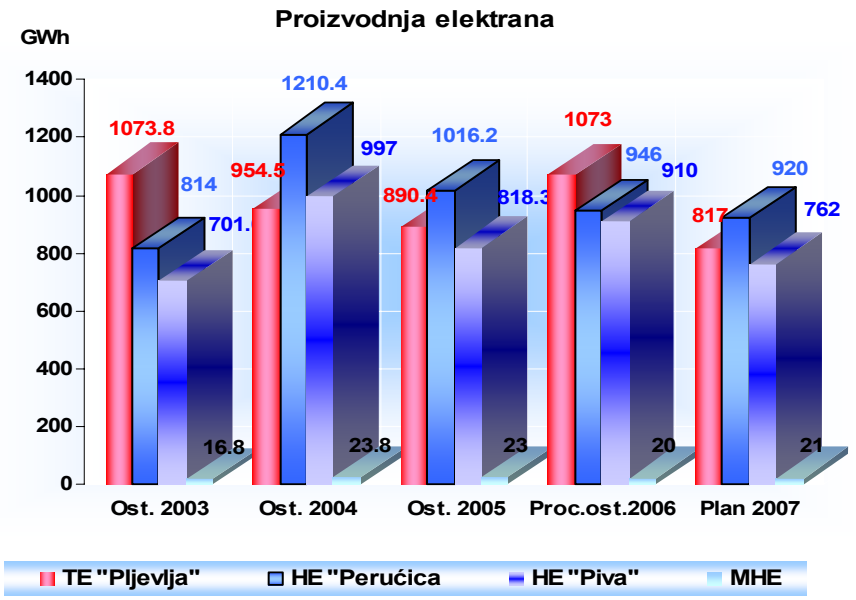

Figure 4: *Achieved production for the period from 2003 until 2005, an estimation for 2006 and a planned production for 2007*

2.4. CONSUMPTION OF ELECTRICAL ENERGY

Planned net energy needs of consumers and losses of electrical energy in Montenegro (not taking into account energy needed for plants` own consumption) in 2007 amount to 4800 GW/h that is 1.8% more than it was estimated in 2006. Figure 5 shows parts of total consumption in 2007.

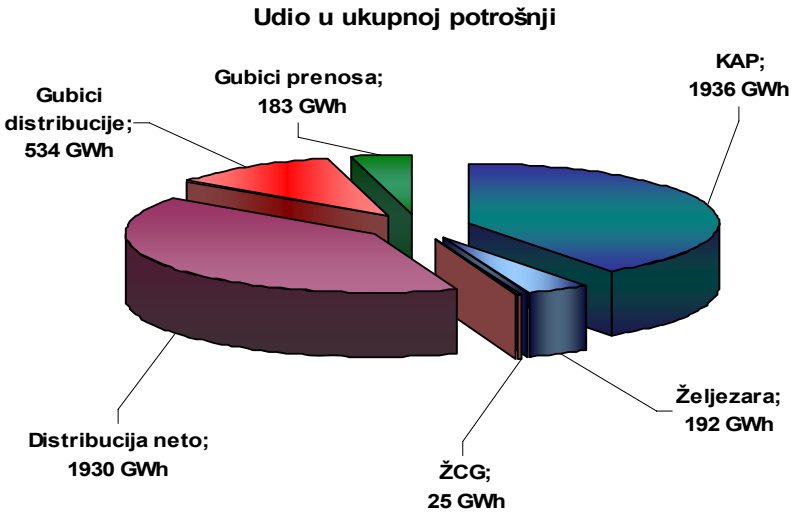

Figure 5*: Parts in total consumption in 2007*

Energy deficit

Import for 2003 – 2005 period, 2006 estimate and 2007 planned import are shown in the Figure 6.

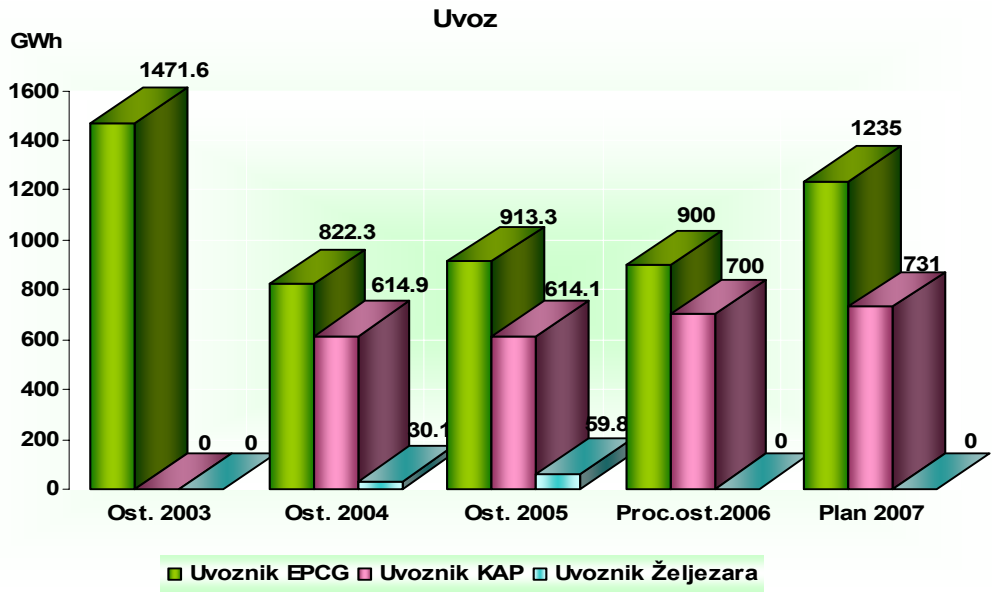

Figure 6: *Import for 2003 – 2005 period, 2006 Estimate and 2007 Planned Import*

By comparing planned amounts of available energy to total energy consumption requirements, the following shortage amounts, i.e. energy deficit is shown:

1. Available energy:	2.834 GWh
– Net generating capacity	2.520 GWh
– Balance exchanges with EPS (for HPP "Piva")	314 GWh
2. Total requirements	4.800 GWh
3. EPCG liabilities	4.069 GWh
4. Energy deficit (2-1)	1.966 GWh
– EPCG liabilities	1.235 GWh
– KAP liabilities	731 GWh

Total energy deficit in Montenegro as related to the gross electricity demand of Montenegro is 1966 GWh (731 + 1235), or 41 %.

Total energy deficit which is liability of the Montenegro's Power Utility is 1235 GWh, which makes 25,72% of gross consumption, i.e. 30,35% of the EPCG total liabilities.

Therefore, 2007 balance sheet does not balance. There is a shortage of 1235 GWh, i.e. 25,72% of energy to meet all the requirements, if the Aluminium Plant's import counts as available amount.

Planned available energy, consumption and energy deficit (imported by EPCG) are shown in Figure 7 by months.

Therefore, the balance sheet for 2007 is not balanced and to supply planned needs, 1235 GWh is missing, i.e. 25.72% of electric energy, if the import of the Aluminum Plant is regarded as available.

Planned available energy, consumption and deficit of electric energy (imported by EPCG) monthly, are shown in Figure 7.

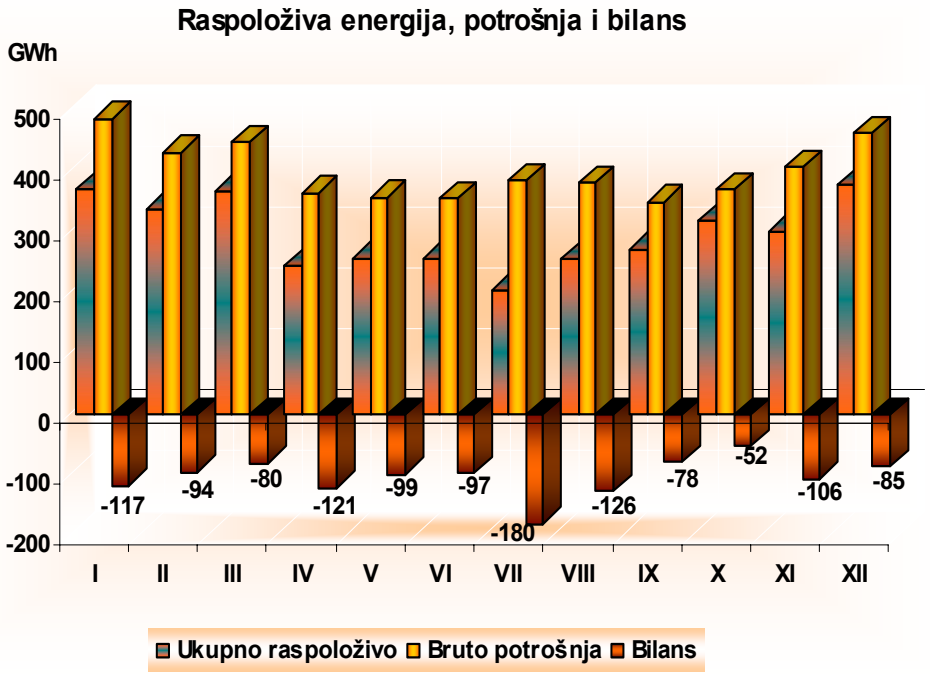

Figure 7: *Planned available energy, consumption and deficit of electric power (imported by the EPCG) monthly*

Based on data from the previous period (1997-2004) in the draft of the Strategy for Energy Development (the Strategy), a forecast of electric power consumption, peak and base load in the power system is given and shown in the Table 3.

Table 3*: Forecasted consumption of electricity, peak and base load in power system*

Year	C max (MW)	C min (MW)	W (GWh)
2005	752,1	361,3	4.443
2006	764,8	367,4	4.518
2007	777,8	373,6	4.594
2008	791,0	380,0	4.672
2009	804,4	386,4	4.751
2010	818,0	391,1	4.765

In the period from 2005 until 2015 the assumed average annual growth of electricity consumption amounts to 1.33% while the average annual growth of peak load within the system amounts to 1.51%. Partnerships with energy producers, states in transition and other international stakeholders would certainly increase the safety of supplying and anticipation within Montenegrin energy system and would be a reliable foundation for urgent and long-term investments in new system capacities.

2.5. REVITALISATION AND RECONSTRUCTION OF PRESENT FACILITIES

Strategy provides greater revitalization of the two capital power plants in Montenegro: HPP Perucica and TPP Pljevlja, and small HPPs. Naturally, regular revitalization is also planned on HPP Piva (expenditures estimated to approximately 70 million EUR). Nevertheless, by the time the Strategy was finished, no reliable information were given as to eventual changes of installed power and/or expected generation of HPP as a result of such changes.

If, tentatively, we sum up the necessary investment funds for revitalization of all three current power plants and small HPPs, not including eventual building of new aggregates, an amount is reached of approximately 152 million EUR (including ecological stabilisation of TPP Pljevlja), as well as increase of power generation capacity for 37 MW.

It has also been recommended in the Strategy to intensify and finalize research of possibilities for installing of eighth aggregate in HPP Perucica of power of 58,5 MW, which would imply total generating power increase of present power plants for 95,5 MW. Such an investment is worth approximately 14 million EUR.

Table 4 shows power plants to be reconstructed, revitalized, and enhanced in terms of their performances following the revitalization and necessary investments.

***Table 4**: Reconstruction, revitalization and enhancement of power plants*

Year	Current facilities		Power/MW		Performance enhancement /MW	Investments /mil. EUR
			Before revit.	After revit.		
2008	Small HPPs		9	9	0	4
	TPP Pljevlja 1		210	225	15	43
	HPP Perucica	Old aggregates	285	307	80,5	35
		New aggregates	58,5	58,5	58,5	14
2010	HPP Piva		105	105	0	70
Total			**609,00**		**95,5**	**166,00**

2.6. TRANSMISSION SYSTEM

Transmission system is momentarily organized in the scope of one enterprise (EPCG) as an Operational Unit – Transmission. This Unit performs the transmission of energy through transmission grid at 110 kV, 220 kV and 400 kV levels, with installed power 774 MVA, 700 MVA and 1.400 MVA and the length of grid 657 km, 400 km and 254 km, along with the power system management and maintenance and development of transmission.

Also, the market operator functions are within the scope of the Transmission Unit. Separation from the Distribution Unit is defined at transformer station fields 35 kV or 10 kV that belong to the Transmission Unit along with TS 110/35 kV and 110/10 kV.

Three generating facilities are connected to the transmission grid in Montenegro:

1) HPP Perucica with installed power 307MW;

2) HPP Piva with installed power 342 MW; and

3) TPP Pljevlja with installed power 210 MW.

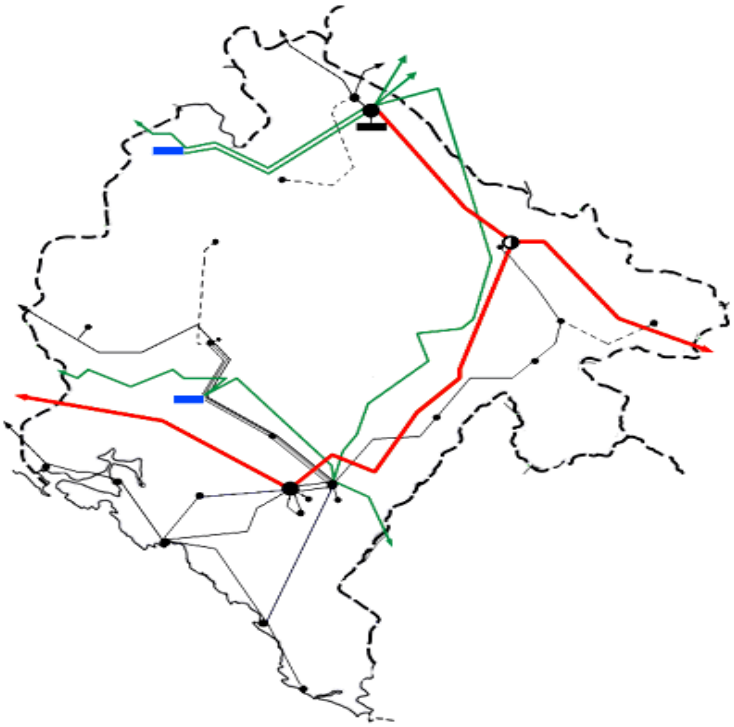

Figure 8: *Montenegrin transmission system*

Due to structure of generating facilities within the EPS of Montenegro, the transmission grid is exposed to various power flows that influence load changes in lines and transformers. Because of insufficient grid infrastructure and delays in its development grid topology remains unchanged together with all the units in operation.

Development of the transmission grid is planned to ensure electricity exchange with neighbouring systems, improvement in supply in certain Montenegrin areas as well as connection to new energy sources and loss reductions.

In the short term period (until 2008) the transmission grid will be strengthened with:

- construction of TS 400/100 kV in Ribarevina (Bijelo Polje);
- connection of TS Andrijevica to 110 kV grid;
- replacement of existing transformer and building in a new one of 20 MVA into TS 110/35 kV –Ulcinj;
- Building of TS 110/35 kV Kotor and its connection to TS 110/35 kV Tivat, construction of long-distance line 110 kV Tivat – Kotor – HPP Perucica; and
- Construction of 400 kV electrical long-distance line Podgorica – Elbasan.

In the mid-term period (by 2010) it is expected to:

- resolve duplicate supply TS 110/35 kV Ulcinj by parallel power line installation to TS 110/35 kV Bar or long-distance line 110 kV Ulcinj – Skadar;
- resolve T-connection TS 220/110 kV Mojkovac;
- build collector storage system 220 kV u TS Mojkovac;
- build TS 220/110 kV Grbalj and long-distance line 220 kV HE Dubrovnik – Grbalj – HPP Perucica; and
- build new TSs 110/x kV and adequately connect them to 110 kV network

2.7. DISTRIBUTION SYSTEM

As an integral part of Montenegro's Power Utility, the Power Distribution Company of Montenegro is in charge of distribution of electricity by using distribution network and maintenance, development and management of the network. There are 16 local power distribution facilities operating within its system and supplying electricity to approximately 285.000 consumers. Distribution network consists of:

- 35 kV delivery lines, 1.150 km in total length
- 10 kV delivery lines, 4.230 km in total length
- 0,4 kV delivery lines, 14.000 km in total length
- TS 35/X kV, 108 facilities
- TS 10/0,4 kV, approximately 3.000 facilities.

2.8. RENEWABLE ENERGY SOURCES

As it was mentioned, by adoption of the Energy Law and the Secondary Legislation, as well as introduction of other regulations and documents at regional and international level, process of deregulation has been commenced in Montenegro along with the process of preparatory activities for creation of free energy market and enabling third party access to the network. These processes create major preconditions for development of small hydropower plants and other renewable energy sources in Montenegro.

2.8.1. Small Hydro Power Plants

Table 5 shows installed power capacity, net plant capacity, as well as realised and planned generation in present small HPPs (sHPPs), hydro power plants (HPPs) and thermal power plants (TPPs) in Montenegro at the end of 2005.

***Table 5**: Installed power capacities and electricity generation in the EPS of Montenegro*

	Installed power		**Net power capacity**		**Average generation**		**Achieved in 2005**		**Plan for 2006**	
	MW	**%**	**MW**	**%**	**GW/h**	**%**	**GW/h**	**%**	**GW/h**	**%**
Existing sHPPs	9,0	1,0	9,0	1,1	21,4	0,9	22,9	0,8	21	0,8
HPP	649,0	74,8	649,0	76,3	1 552,0	62,2	1 818	66,6	1 673	60,5
TPP	210,0	24,2	193,0	22,7	922,0	36,9	890	32,5	1 073	38,7
TOTAL	868,0	100,0	851,0	100,0	2495,4	100,0	2 730,9	100,0	2 767	100,0
Total available*					2 786		3795,9		3 832	

* Category 'Total available' marks total available electricity in EPS of Montenegro taking into account contract on electricity exchange with Serbian HPP Piva system (1065 GWh)

In current planning documents, gross hydro potential of smaller watercourses has been estimated to approximately 800-1000 GWh, out of which 400GWh/per annum has been estimated to be actually usable potential of smaller hydro power plants at 70 potential locations. Such an estimate has been given according to the assessment of rather resolute environmental and spatial constraints of smaller watercourses.

According to the referent scenario, until 2010 the construction of a number of small hydro power plants is forecasted, with a total installed power 5 MW and construction of additional

15 MW at appropriate locations until 2015. In the period of 10 years it is anticipated that installed capacities and electricity generation in small HPPs will be 3 times larger in comparison with the existing status at the end of 2005.

Studies on small HPPs potentials provide a wide choice of interesting locations. Plants at small watersheds are characterized with small flows and relatively big falls. Table 6 shows parameters for new small HPPs.

***Table 6**: Parameters for the groups of new small HPPs*

Group	Installed power (MW)	Annual generation (GW/h)
small HPPs 1	10	28
small HPPs 2	20	50

In current planning documents gross hydro energy potential at small watersheds was estimated to be 800-1000 GW/h, and it is thought that realistically usable potential of small HPPs, at 70 potential locations is 400 GWh. That estimation is based on resolute ecological and space limitations that are set up in a series of watersheds.

There are proposals in Montenegro to: (i) create optimal investment incentives design in relation to credits with favourable repayment terms, and (ii) issuance of Government Guarantees, based on model such as:

Partial Interest Subsidy – After a commercial credit had been granted to an investor, an amount of interest is subsidized that equals the difference between interest rate charged to an interested investor and interest rate that would have made the project cost-effective and acceptable to the investor. Before that, it is necessary that the Government and the Energy Regulatory Agency adopt general criteria for "cost-effectiveness" of small HPP projects (such as IRR, repayment period, concession terms, etc); and

Guarantees Issuance – Guarantee is issued to an investor to whom the credit is to be granted by a national or foreign bank, which reduces investor's risk when applying for credit, as well as the costs of credit.

The Methodology for Determining Electricity Purchase Price from Small HPPs will ensure economic efficiency of small HPP projects and attract investors.

2.8.2. Wind Energy

According to the data available, it is not possible to precisely determine best wind power micro locations. These data may only serve for approximate location detection of areas with high-quality potential of wind power. Potentially useful areas are the ones in the vicinity of Niksic, mountain sides above the sea and coastal area. With investment expenditures of 1.000 EUR/kW and expected operating hours of 2.200 per year, four wind farms are envisaged (each of 5 MW power) to be put in operation in 2010, 2015, 2020 and 2025.

2.8.3. Energy from Waste

Territory of Montenegro has been assessed to have 200.000 do 250.000 tones of solid waste per annum formed. This opens up a possibility of building 3 to 5 industrial facilities for the burning of it, depending on its volume. Given the volume of communal waste in bigger towns, it has been predicted that the potential locations for such facilities would be adjacent to these centres (Podgorica and Niksic).

2.8.4. Solar Energy

Present knowledge does not give an optimistic view of considerable use of solar energy for electric energy generation. Major constraint to considerable use of photovoltaic systems is installation price that ranges between 5.000 and 7.000 USD/kW, while their conversion efficiency is rather low (8 to 20%).

2.8.5. Biomass Energy

In the existing circumstances there is no economic and energy basis for taking into account the biomass as a potential for energy production, though preliminary data in some studies on available potential of biomass resources give estimation that technically it was enough to build 3 to 5 small power plants with specific capacity between 5 and 10 MW, according to available biomass resources. The Strategy does not anticipate construction of such plants for electricity production.

3. NATURAL GAS

Montenegro does not have access to international natural gas resources. If there is no domestic production there will be few supply directions in the future - through Serbia, Albania and Croatia. Considering all these options Montenegro can expect gas supply from international gas lines after 2020.

The significance of the supply of necessary gas quantities for Montenegro is also why Montenegro signed the Energy Community Treaty.

Planned researches in Montenegrin marine will show if there are Montenegrin possession of gas. If the gas would be found it would be natural to expect that the gas system supply will be developed faster then in the case of gas import.

In Montenegro there is low potential for gas consumption, and the planned investments into gas network development are extremely high. It is anticipated that the gas network development and TNG consumption will happen prior to gas consumption.