SECURITY OF SUPPLY STATEMENT FOR MONTENEGRO

Prepared by Ministry of Economy

Podgorica, September 2011
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1. LEGAL FRAMEWORK FOR ENSURING THE SUPPLY

1.1. The Energy Law (“Official Gazette of Montenegro”, no. 28/10) defines energy related activities, the conditions for and method of carrying out energy activities, aiming to provide quality and efficient supply of energy to final consumers. The Law is fully compliant with Directive 2005/89/EC concerning measures to safeguard security of electricity supply and infrastructure investment and Directive 2004/67/EC concerning measures to safeguard security of national gas supply and it is partially compliant with Directive 2006/67/EC imposing an obligation to maintain minimum stocks of crude oil and/or petroleum products.

The Law in particular regulates the following:

1) Energy activities and public services in the energy sector, as well as activities of general interest;
2) Organization and functioning of the electricity market;
3) Transition from regulated pricing of coal for electricity generation to market pricing;
4) Distribution, storage, wholesale and retail business and supply of petroleum products, reserves and transport of oil and oil derivates, in the part not regulated by other regulations;
5) Exceptions from the application of regulations, conditions and deadlines for the use of the systems, for new infrastructure for transmission of electricity and gas, storage of gas or liquefied natural gas;
6) Energy development, use of renewable energy sources and cogeneration, incentives to use renewable energy sources and cogeneration during the construction and operational phase;
7) Policies, standards and rules for organizing and regulating markets for electricity and gas, including the rights and obligations of market participants;
8) Energy efficiency in the sector of generation, transmission and distribution of energy.

Obligation to supply services of general interest

Energy undertakings designated to carry out activities referred to in article 68 hereof as the service of general interest shall be obliged, in accordance with conditions laid down in the license, to provide services of general interest by observing: safety of supply, quality of services and supply, application of regulated tariffs for supply or use of storage or facilities for TPG or TNG or regulated prices for use of transmission or distribution systems, the need for primary energy sources, gas and oil, environmental protection, protection of health, life and property of citizens, measures for protection of energy consumers and customers. Provision of services of general interest must be non-discriminatory, transparent and easily consigned.

Supplier of last resort

Supplier of last resort will supply the electricity or gas to the final consumer without the consumer’s request in the event when: the supplier who used to supply the final consumer has no more capacities to provide the final consumer with agreed services due to the bankruptcy, i.e. insolvency or serious market distortions, while the consumer has no possibility to influence occurred circumstances and if not protected would lose the supply.

1.2. Energy Policy of Montenegro by 2030 has been adopted by the Government on 03 March 2011. The main priorities of the Energy Policy are continuous, safe, high-quality and
diverse supply of energy for the purpose of balancing the delivery with the consumer’s demand, creating liberalized, non-discriminatory, competition-based and open energy market based on transparency, enabling competition in the energy market (generation and supply of electricity and natural gas), setting pricing policy for energy-generating products based purely on the market principles and creating conditions for introduction of the new energy undertakings (autonomous energy producers, suppliers and traders), ensuring sustainable energy development based on accelerated, but rational use of own energy resources, taking into account principles of environmental protection, increase of energy efficiency (EE) and more use of renewable energy sources (REE), including the need for socio-economic development of Montenegro.

Key strategic commitments are maintaining, revitalizing and modernization of the existing and development of new infrastructure for generating, transmission and distribution of energy by observing principles of international technical standards, energy efficiency, reducing losses and negative effects to the environment, gradually reducing energy import dependence by (i) reducing specific consumption of final energy, (ii) increasing generation of energy (primary and secondary) by using own resources and the share of renewable energy sources and (iii) reducing energy losses incurred and increasing efficient use of energy from generation to final consumption. From being the net importer of energy Montenegro is planning to become the net exporter of electricity after 2020, implementing strategic 90-day supply stocks of oil derivates in accordance with the EU Energy policy.

1.3. Current Energy Development Strategy of Montenegro by 2025 has been adopted by the Government of Montenegro in December 2007, while the Action plan for its implementation for period 2008-2012 has been adopted in October 2008. The Energy Law (“Official Gazette of Montenegro”, no. 28/10) recognized the strategic development of energy sector as dynamic process which requires constant monitoring, testing, review and updating - when needed or following the five year period. The Law stipulates that the Strategy should be updated in accordance with development plan of Montenegro for period of at least 10 years, while the Action plan should be revised annually by reviewing reports delivered to the Government by the Ministry of Economy.

Furthermore, on the basis of the analyses of the current situation in the energy sector of Montenegro and the region itself and based on the results of the Action plan, at the end of 2009 the Government of Montenegro confirmed the need to adjust the Energy Development Strategy of Montenegro and the Action plan for its implementation to the existing situation in the energy sector and to the real needs of its future development. Therefore, at its session held on 10 June 2010, the Government of Montenegro adopted Informative Memorandum on activities related to updating the Energy Development Strategy of Montenegro by 2025 and the Action plan for its implementation and ordered the Ministry of Economy to initiate activities on updating these documents, all in accordance with the proposed concept.

Following the adoption of the innovated Energy Development Strategy of Montenegro by the Government, development of the Action plan for implementation of the Energy Development Strategy of Montenegro for period 2012-201 will commence.
2. INSTITUTIONAL FRAMEWORK

2.1. The Energy Regulatory Agency of Montenegro

The Energy Regulatory Agency has been incorporated by the Energy Law (“Official Gazette of the Republic of Montenegro”, no. 39/03) as the autonomous, functionally independent and non-profit organization entrusted with the power to regulate the energy sector of Montenegro in accordance with this Law. The Law has ceased in May last year. In the course of its implementation, the Agency was institutionally established and through its documents and operations it became the active stakeholder implementing changes and reforms which took place in energy sector of Montenegro.

The new Energy Law (“Official Gazette of Montenegro”, no. 28/10), effective as of 22 May 2010, encompass the same objectives which should be achieved in the energy sector and implements the latest EU Directive in the energy sector. The Agency is no longer setting the price of coal for electricity generation, does not issues authorizations for construction of energy structures, does not regulate the price of generating electricity (expect when this is the integral part of regulated tariffs for supply) and no longer regulates suppliers’ fees (expect for the public supplier).

However, on the other hand, the new Energy Law expanded operations of the Agency to new areas, entrusting it with even more powers related to the energy undertakings. New competences of the Agency encompass setting of tariffs for supply of electricity to specific customers, issuing licenses for generation and supply of electricity and for supply of heat through remote control heating/cooling systems, issuing license for gas related activities (expect for exploitation and production), setting up the minimum quality standards in the electricity supply, issuing guarantees of origin to energy undertakings generating energy from renewable energy sources or highly efficient cogeneration, granting status of privileged producer of electricity.

Aiming to strengthen capacities of the Agency, the EU funded Project of Technical Assistance for implementation of the Treaty Establishing the Energy Community is ongoing. This project aims at strengthening professional capacities of employees, providing assistance in developing documents of the Agency and efficient fulfillment of obligations set with the Treaty Establishing the Energy Community. Moreover, professional development of employees is also achieved through their direct participation in workshops and seminars organized by the Energy Regulators Regional Association (ERRA) and Energy Community Regulatory Board (ECRB).

2.2. The Authority for Protection of Competition

The Law on Protection of Competition (“Official Gazette of the Republic of Montenegro”, no. 69/05 and 37/07), regulates the competencies of the Agency for Protection of Competition:

- monitoring general market competition, as well as competition on the markets of specific economy sectors;
- approving exceptions from certain prohibited agreements and approving concentrations of participants under prescribed conditions and resolving other issues competent for, in accordance with the law;
- deciding in a process for establishing violation of competition as determined by the law;
Security of Supply Statement of Montenegro

- undertaking measures against the participants and associations of participants for breach of competition or aiming at preventing such breach from occurring, ending the breach already occurred and eliminating adverse effects on participants and consumers;
- analyzing situation on the market from the point of view of free and efficient competition and deliver reports thereon to the Ministry;
- developing documentary basis for designing bylaws, implementing the European and other international standards and instruments related to the protection of competition;
- establishing international cooperation with authorized bodies of other states and international organizations;
- publishing statistic data related to the protection of competition, etc.

Administrative capacities

Pursuant to the current Rulebook on Internal Organization and Systematization of the Agency for Protection of Competition (hereinafter referred to as: the Agency), there are 16 state officials and civil servants. Presently, the Agency employs 12 civil servants, including the Director, while five of these are engaged in protection of competition.

Operations of the Agency are organized within the three organizational units, namely:
1. Sector for monitoring concentrations, prohibited agreements, abuse of dominant position and international cooperation,
2. Section for conducting misdemeanor procedure, and
3. Department of general affairs.

Having in mind the upcoming activities of the Agency, new civil servants with specific knowledge must be employed. Special attention should be paid to the exchange of international practice related to the protection of competition.


Based on obligations deriving from the Stabilization and Association Agreement (article 72 and 73), text of the draft Law on Protection of Competition has been harmonized with the EU legislation and standards pertaining to competition. Proposal of the Law on Protection of Competition has been submitted to the Parliament for relevant procedure.

Proposal of the draft new Law on Protection of Competition envisage establishment of the autonomous authority – the Agency for Protection of Competition, in accordance with the European practice. Proposed model for its organization and operations related to protection of competition presupposes the functional and financial independence of this authority, especially through the financing from fees charged for undertaking operations falling under the scope of the Agency and through the possibility to reach the final decisions.

3. ENERGY BALANCE

The Energy Law ("Official Gazette of Montenegro", no. 28/10) in its chapter II, article 15, stipulates that the annual Energy balance will be passed by the Government of Montenegro not later than 15 December for the upcoming year. Article 13 of the Law stipulates that the Energy balance consist of the following:

1) electricity balance, 2) coal balance, 3) balance of oil, oil derivates, bio-fuels and gas, except for the natural gas, 4) natural gas balance and 5) balance of remote heating and/or
cooling for industrial use. Energy undertakings are obliged to prepare and deliver to the Ministry of Economy relevant energy balances, not later than 15 November of the current year for the upcoming year.

In line with the present contractual obligations, all energy undertakings and energy traders are obliged to adjust their balances with the Energy balance of Montenegro, not later than 31 December of the year for which the balance is adopted.

Energy balance of Montenegro for 2011 has been prepared on the basis of the energy balance adopted by the Board of Directors of the Electric Power Holding Company of Montenegro at its session held on 10 November 2010, coal balance passed by the Board of Directors of the Coal mine Pljevlja, as well as estimated turnout of oil derivates by oil companies (Jugopetrol AD Kotor, Montenegro Bonus, INA Crna Gora, Energogas). Furthermore, the needs of certain business entities were also considered (Aluminum plant Podgorica, Steelworks Niksic, Public Works Directorate), who procure certain energy-generating products on their own, through international tenders.

According to Energy Law the Ministry of Economy shall issue the contents and form for submitting of data on the energy generation and consumption plan and realization required for the development of the Planned Balance and tracking the realization. Regulation is prepared and it is expected to be adopted until the end of 2011.

3.1 ACHIEVING ENERGY BALANCE BY ELEMENTS

I Generating

In 2010, the overall generated electricity, at the power plant threshold, in Montenegro was 4,021.3 GWh, which is 881.3 GWh or 28.1% more than planned, i.e. 50.1% more than in previous year.

The highest generation was recorded in December (543 GWh), while the lowest generation was recorded in August (146.1 GWh).

In 2010, certain periods recorded extremely high inflow, especially at the beginning and at the end of the year, as shown in the comparison given in the table on page 15, which resulted in extremely high generation in hydropower plants.

- **HPP "Perućica"** has achieved its highest record since it started its operations, by generating 1,434.9 GWh, which is 477.9 GWh or 49.9% higher than planned, i.e. 30.5% more than generated in 2009.
- **HPP "Piva"** has also achieved record since it started its operations (1976) by generating 1,285.8 GWh, i.e. 523.8 GWh or 68.7 % more than planned, and 36.3 % more than generated in previous year. Furthermore, in January and December HPP “Piva” has recorded weir amounting to 79.78 GWh.
- Small HPP generated 28.9 GWh, which is 7.9 GWh or 37.4% more than planned and 45 % more than generated in previous year.
- **TPP "Pljevlja"** has also achieved record since it started its operations by generating 1,271.7 GWh, which is 128.3 GWh or 9.2%, less than planned, but 106.1 % more than generated in previous year.
II Consumption

In 2010, the overall consumption of electricity in Montenegro was 4,021.7 GWh, which is 239.3 GWh or 5.6% less than planned, but 7% more in comparison with the previous year.

Characteristics of consumptions:

- The highest monthly consumption was recorded in December (409 GWh), while the lowest was recorded in May (292.4 GWh).
- The highest daily consumption was recorded on 17 December (14,732 MWh), while the lowest was recorded on 2 May (8,868 MWh);
- The highest average hourly load was recorded on 17 December at 7 p.m. (712 MW), while the lowest was recorded on 3 May at 5 a.m. (282 MW), not taking into account days which recorded less load due to the distortions in EES.

The structure of consumption:

- Recorded consumption in the Aluminum Plant Podgorica was 1,241.2 GWh, which is 72.8 GWh or 5.5% less than planned, i.e. 275.5 GWh or 28.5% more than consumption in the previous year;
- Recorded consumption in the Steelworks Niksic was 79.2 GWh, which is 123.8 GWh or 61.0% less than planned, i.e. 43.4 GWh or 35.4% less than consumption in the previous year;
- Railway Infrastructure of Montenegro recorded consumption of 20.7 GWh, which is 3.3 GWh or 13.9% less than planned and 2.5 GWh or 13.6% more than consumption in the previous year;
- Overall distribution consumption was 2,516.2 GWh, which is 51.8 GWh or 2.0% less than planned, and 14.6 GWh or 0.6% more than consumption in the previous year;

Net consumption of distribution consumers calculated and invoiced by FU Supply (1,998.7 GWh) and unauthorized consumption which was calculated and invoiced by FU Transmission (14.7 GWh), has been presented in the following table.

- During the overhaul, i.e. during the months when there was no generation in TPP „Pljevlja“, 0.05 GWh were taken from the transmission network, which is presented as separate item in the table.

Within the consumption structure, the share of certain consumers is the following:

Total consumption (with transm. losses): Net consumption (with no transm. losses):
- Aluminum plant 30.9 % - Aluminum Plant 32.2%
- Steelworks 2.0 % - Steelworks 2.1%
- Railway Infrastructure 0.5 % - Railway Infrastructure 0.5%
- Direct consumers 33.3 % - Direct consumers 34.8%
- Distribution total 62.6 % - Distribution total 65.2%
- Transmission losses 4.1 %
III Losses

a) Transmission network:

For covering electricity losses in the transmission network, the Energy Power Holding Company of Montenegro in 2010 has delivered to the Transmission 164.4 GWh, which is 8.2% more than planned.

b) Distribution network:

Total losses in the distribution network in 2010 amount to 502.9 GWh, which is 40.9 GWh or 8.8% more than planned, i.e. 67.1 GWh or 11.8% less than in the previous year. In comparison with the total consumption of distribution network customers, losses are 19.9%. In comparison to the total system consumption, losses comprise 12.5%.

IV Accumulation and inflow

Hydrological conditions in Montenegro at the beginning and at the end of last year were better than planned in accordance with multi-annual hydrological sequence, as presented in the graphic display following this text.

Accumulations of HPP "Perućica", at the beginning of the year were 158 GWh which is 8 GWh more than planned. Accumulations at the end of the year (31 December) reached 190 GWh, which is 46.1 % more than planned. Furthermore, there was approximately 81.1 GWh in Vrtac retention. Average annual inflow was 62.67 m$^3$/s, which is significantly more than planned (20.45 m$^3$/s), thanks to the extremely high inflow in January, February, March, April, November and December.

HPP "Piva" was operating at average monthly elevation points of 674.1 m asl in December up to 649.5 m asl in October, while it reached the average annual elevation of 664.6 m asl. Average annual inflow was 99.4 m$^3$/s. Accumulation conditions at the end of the year recorded 287.5 GWh, which is 157.5 GWh or 121.1 % more than planned.
Security of Supply Statement of Montenegro

Graphic overview of inflow and accumulations reached (at the beginning of the month) is presented bellow.
Table: 1 Energy balance (GWh)

<table>
<thead>
<tr>
<th>Balance elements</th>
<th>Achieved in 2009</th>
<th>Achieved in 2010</th>
<th>Plan for 2010</th>
<th>(2)/(1)</th>
<th>(2)/(3)</th>
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</thead>
<tbody>
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<td></td>
<td>1</td>
<td>2</td>
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<td>1. GENERATING</td>
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<tr>
<td>1.1. Generation HPP – power plant</td>
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<tr>
<td>threshold</td>
<td></td>
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</tr>
<tr>
<td>HPP “Perućica”</td>
<td>2,062.6</td>
<td>2,749.6</td>
<td>1,740</td>
<td>133.3</td>
<td>158.0</td>
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<td>HPP “Piva”</td>
<td>1,099.6</td>
<td>1,434.9</td>
<td>957</td>
<td>130.5</td>
<td>149.9</td>
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<td>Small HPP</td>
<td>943.1</td>
<td>1,285.8</td>
<td>762</td>
<td>136.3</td>
<td>168.7</td>
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<td>1.2. Generation in TPP “Pljevlja” –</td>
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<tr>
<td>threshold</td>
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<td></td>
<td>19.9</td>
<td>28.9</td>
<td>21</td>
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<td>- on the basis of the Agreement</td>
<td>1,184.4</td>
<td>1,203.6</td>
<td>1,075</td>
<td>100.0</td>
<td>100.0</td>
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<td></td>
<td>108.9</td>
<td>128.1</td>
<td>....</td>
<td>117.6</td>
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<td>3. IMPORT</td>
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<td>- Purchase</td>
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<td>1,203.6</td>
<td>1,075</td>
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<td>100.0</td>
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<td>- Linked trade</td>
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<td>1,075</td>
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<td>100.0</td>
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<td>- ERS on the basis of the Agreement</td>
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<td>128.1</td>
<td>....</td>
<td>117.6</td>
<td>.....</td>
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<tr>
<td>- Exchange with other systems</td>
<td>616.9</td>
<td>1,271.7</td>
<td>1,400</td>
<td>206.1</td>
<td>90.8</td>
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<td>4. Deviation – taking over from EES</td>
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<td>18.7</td>
<td>11.0</td>
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<td>58.7</td>
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<td>5. DELIVERY TO EPS</td>
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<td>1,168.1</td>
<td>1,450.7</td>
<td>762</td>
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<td>99.9</td>
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<td>6. EXPORT</td>
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<td>171.7</td>
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<td>118.7</td>
<td>.....</td>
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<td>- Exchange with other systems</td>
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<td>30.5</td>
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<td>132.6</td>
<td>.....</td>
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<td>7. Deviation – transferring to EES</td>
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<tr>
<td></td>
<td>3.3</td>
<td>12.3</td>
<td></td>
<td>371.4</td>
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<td>8. AVAILABLE FOR CONSUMPTION</td>
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<tr>
<td>(1+2+3+4)-(5+6+7)</td>
<td>3,757.5</td>
<td>4,021.7</td>
<td>4,261</td>
<td>107.0</td>
<td>94.4</td>
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<td>9. CONSUMPTION</td>
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<tr>
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<td>3,757.5</td>
<td>4,021.7</td>
<td>4,261</td>
<td>107.0</td>
<td>94.4</td>
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<td>9.1. Direct consumers</td>
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<tr>
<td>- Aluminum Plant</td>
<td>1,106.5</td>
<td>1,341.0</td>
<td>1,541</td>
<td>121.2</td>
<td>87.0</td>
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<td>- Steelworks</td>
<td>965.7</td>
<td>1,241.2</td>
<td>1,314</td>
<td>128.5</td>
<td>94.5</td>
</tr>
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<td>- Railway infrastructure of Montenegro</td>
<td>122.6</td>
<td>79.2</td>
<td>203</td>
<td>64.6</td>
<td>39.0</td>
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<td>9.2. Distribution consumption</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>- Net consumption</td>
<td>2,501.6</td>
<td>2,516.2</td>
<td>2,568</td>
<td>100.6</td>
<td>98.0</td>
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<td>- Losses in distribution network</td>
<td>1,931.6</td>
<td>2,013.4</td>
<td>2,106</td>
<td>104.2</td>
<td>95.6</td>
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<td>9.3. Losses in transmission</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>570.0</td>
<td>502.9</td>
<td>462</td>
<td>88.2</td>
<td>108.8</td>
</tr>
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<td>9.4. Consumption of TPP for its own needs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.9</td>
<td>0.05</td>
<td></td>
<td>2.5</td>
<td>.....</td>
</tr>
</tbody>
</table>

The main features of the energy sector, which are of great importance for realization of the Energy balance in 2011, are the following:

1 During overhaul, TPP “Pljevlja” takes from the system all the electricity for its needs for own needs
Security of Supply Statement of Montenegro

- Consumers’ demand for electricity is significantly higher than generation potential of the Energy Power Holding Company of Montenegro, both with respect to the electricity and capacity power;
- Complex energy related conditions in the region with regards to providing missing quantities of electricity;
- Existing congestion in transmission capacities in the region directly related to importing electricity to Montenegro – capacities are divided bilaterally by observing rather strict UCTE rules, taking into account calculations of power flow for two months in advance;
- Capital increase and partial privatization of the Energy Power Holding Company of Montenegro has been carried out, so the company remained 55% ownership of the state, 43.7% ownership of A2A and 1.3% of minority shareholders;
- Planned capital increase of Montenegrin Transmission Companies by Terna, which will be the investor for implementation of the project of building undersea interconnection between Montenegro and Italy, while the state will remain majority owner of Montenegrin Transmission Company holding 55% of shares.

Such situation in the energy sector requires the additional efforts of not only energy undertakings, but also of other legal entities, including the competent Montenegrin authorities, aiming to provide needed quantities of all forms of energy-generating products, so to prevent that their insufficiency occurs as a limiting factor for the overall economic development of Montenegro.

3.2. ANALYZE OF THE LONG-TERM SERIES OF ENERGY BALANCE OF MONTENEGRO (1990, 1997-2010)

Graphics presented bellow demonstrate trends in relevant periods for different selected categories of the Energy balance.

Graphic 1.1 – Gross domestic consumption (GDC) in period from 1997 to 2008 recorded increase from 32.66 PJ in 1997 to 49.54 PJ in 2008 or 3.86% per year. Reduced production in the Aluminum plant and problems with the Steelworks has significantly reduced consumption in 2008-2009. In this period, energy dependency of Montenegro increased from 40.5% (1998) to 55.3% (2007) (Graphic 2.1), while in 2010 it dropped down to 29.5% due to the practically eliminated net import of electricity (Graphic 2.1). In 5-year period, from 2005 to 2010, Montenegro had 100% imports of all liquefied fuels and in average 30.1% (1.322 GWh per year) of electricity.
Graphic 1.1: Gross domestic consumption by source, 1990 and 1997 -2010 (PJ)

Graphic 1.2 - Similar to GDC presented in Graphic 1.1, the final energy consumption in period 1997-2008, indicates a constant growth (in average 3.74% per year, from 23.9 PJ in 1997 to 35.7 PJ in 2008). The structure of consumption in 2009 records reduced consumption by Aluminum plant and Steelworks. Depending from the year, consumption of the industry was prevailing (40-45%), other consumption – households and services (30%-35%), while the share of transport sector in the consumption was 20%-30%. In situation of reduced consumption of black metallurgy and metallurgy of non-ferrous metals in 2009-2010, it is noted that transport sector had become the dominant sector (39%) in comparison to other consumption (37%), and this sector has recorded continuous increase in consumption, which indicates the important role of transport sector in the future consumption of final energy.
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**Graphics 1.3-1.4** – Final energy consumption in the industry recorded increase in period 1997-2008, especially because of non-ferrous metals which constituted 75%-85% of the overall energy consumption in the industry. In period 2009-2010, consumption dropped down for 50% due to decreased production of Aluminum plant and Steelworks. Apart from production of non-ferrous metals, black metallurgy had 6%-14% share in the relevant period.

Graphics 1.3: Final energy consumption by industry, 1990 and 1997-2010 (PJ)

Graphics 1.4: Final energy consumption by industry, 1990 and 1997-2010 (%)

**Graphics 1.5-1.6** – This graphic presents GDC by the structure of primary energy sources. Depending from the relevant year, oil derivates together with solid fuels comprise approximately 70%, out of which imported oil derivates comprise approximately 35%-45%
and domestic coal 35%-25%. Hydro-energy, depending on unforeseeable hydrology in the relevant year, reached 9.5%-22% in period 1997-2010, while the rest was imported in a form of electricity (up to the maximum of 2.588 GWh in 2007). It is assumed that the annual share of firewood and waste was rather constant (approximately 2 PJ or 4%-5% of gross consumption).
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**Graphics 1.7-1.8** – These present timeline of the method of electricity supply in Montenegro from 1990 and the average contribution of relevant power plants and of the import in the overall supply. Net import together with exchange of electricity with the Republic of Serbia pursuant the agreement on exploitation of HPP Piva reached approximately 35%, while the rest was covered by HPP Perućica (22.9%), TPP Pljevlja (22.1%), HPP Piva (19.5%) and small HPP (less than 1%).

Final electricity consumption in period 1997-2010 recorded increase, but slower than the growth of net consumption - 1.93% per year (from 3,091 GWh in 1997 to 3,816 GWh in 2008). Following decreased production in the Aluminum plant and the Steelworks in 2009, final electricity consumption has dropped to 3,320 GWh. In the situation of excellent hydrological conditions in this year and more than average generation in all HPP (4.171 GWh gross), together with TPP Pljevlja (1.272 GWh), the energy system of Montenegro for the first time in the relevant period was able to provide sufficient electricity from its own sources to cover the consumption.
Table 2: Net generation of electricity and availability to EES (2005-2010)

<table>
<thead>
<tr>
<th>Year</th>
<th>GWh</th>
<th>PJ</th>
<th>GWh</th>
<th>PJ</th>
<th>GWh</th>
<th>PJ</th>
<th>GWh</th>
<th>PJ</th>
<th>GWh</th>
<th>PJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>2,864</td>
<td>10,31</td>
<td>2,935</td>
<td>10,65</td>
<td>2,141</td>
<td>7,78</td>
<td>2,836</td>
<td>10,16</td>
<td>2,762</td>
<td>9,94</td>
</tr>
<tr>
<td>2006</td>
<td>2,864</td>
<td>10,31</td>
<td>2,935</td>
<td>10,65</td>
<td>2,141</td>
<td>7,78</td>
<td>2,836</td>
<td>10,16</td>
<td>2,762</td>
<td>9,94</td>
</tr>
<tr>
<td>2007</td>
<td>2,864</td>
<td>10,31</td>
<td>2,935</td>
<td>10,65</td>
<td>2,141</td>
<td>7,78</td>
<td>2,836</td>
<td>10,16</td>
<td>2,762</td>
<td>9,94</td>
</tr>
<tr>
<td>2008</td>
<td>2,864</td>
<td>10,31</td>
<td>2,935</td>
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<td>2,141</td>
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<td>2,836</td>
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<td>2,836</td>
<td>10,16</td>
<td>2,762</td>
<td>9,94</td>
</tr>
<tr>
<td>2010</td>
<td>2,864</td>
<td>10,31</td>
<td>2,935</td>
<td>10,65</td>
<td>2,141</td>
<td>7,78</td>
<td>2,836</td>
<td>10,16</td>
<td>2,762</td>
<td>9,94</td>
</tr>
</tbody>
</table>

4. ENERGY SECTOR OF MONTENEGRO

4.1. Primary legislation

1. The Energy Law ("Official Gazette of Montenegro", no. 28/10) regulates energy activities, conditions for and method of carrying out these activities, ensuring quality and safe energy supply to the final customers. The Law is fully compliant with Directive 2005/89/EC concerning measures to safeguard security of electricity supply and infrastructure investment and Directive 2004/67/EC concerning measures to safeguard security of national gas supply, and partially compliant with Directive 2006/67/EC imposing an obligation to maintain minimum stocks of crude oil and/or petroleum products.

4.2. Secondary legislation


Rulebook on the method of calculating purchase price of electricity from wind power plants ("Official Gazette of Montenegro", no. 27/10) is fully compliant with Directive 2009/28/EC. This Rulebook defines the method of calculating purchase price of electricity generated from wind power plants, as determined on the basis of the actual costs including investment costs and costs of maintaining and operating wind power plants.
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Provisional methodology for setting up regulatory revenue and prices for the use of electricity transmission system ("Official Gazette of Montenegro", no. 58/10)
As of 31 March 2009, the Transmission Network Operator became a fully autonomous entity and it was necessary to create a separate methodology for it. This methodology regulated the method of setting regulatory revenue and, which is of special importance, the method of allocating such revenue to all the users of the system in unbiased, non-discriminatory and transparent manner.

Provisional methodology for setting up regulatory revenue and prices for the use of electricity distribution system ("Official Gazette of Montenegro", no. 58/10), Pursuant to the Energy Law, Distribution System Operator should be established as the autonomous legal entity, not later than 22 May 2011. Therefore, a special methodology was needed and it was developed on the same principles as the aforementioned one.

Provisional methodology for setting up regulatory revenue and regulated tariffs for the electricity supply ("Official Gazette of Montenegro", no. 58/10), Pursuant to the Energy Law, supply of households and eligible customers with electricity by applying regulated tariffs, shall be done as public service provided by the supplier which is determined by the Government in accordance with this law. Therefore, it was necessary to establish a separate methodology regulating rules for approving or determining regulatory allowed revenue and fees for public supplier services, including tariffs applied on the supply of tariff customers and eligible customers who have chosen such model of supply.

Rules on conditions for and process of changing electricity suppliers, adopted at the session held on 20 December 2010.
This is another document which was necessary for improving the transit of electricity consumers from the public supplier to commercial suppliers. The consumer may change the supplier by observing minimum administrative requirements, with no restrictions whatsoever and free of charge.

Rules for resolving disputes through the arbitrage, adopted at the session held on 29 December 2010.
It is expected that adoption of this document would relieve the courts from significant number of “less important cases”, that it will have positive effect on the time needed to resolve the dispute and encourage interested entities to enter the market.

Rules for operations of the public supplier, adopted at the session held on 14 January 2011.
These Rules provide the framework for proper, efficient and uninterrupted functioning of the public supplier in the course of conducting activities related to supply of electricity to the tariff and eligible customers.

4.3. Existing power plants

Energy system of Montenegro consists of three major generation units: hydropower plants Perućica and Piva and thermo power plant Pljevlja. Along with these, there are seven small hydropower plants, but their contribution in terms of capacity and generation is relatively small. Total installed capacity of power plants in the system amounts to 868 MW, while power at the threshold is 849 MW.
Montenegro records a significant unbalance between the electricity generation and consumption, which is covered from import. Due to this deficit, construction of new resources within the energy sector is of great importance. Following text will give a detailed description of certain facilities for generation of electricity.

**Hydropower plants**

Hydro energy plays the important role in the energy system of Montenegro, since more than 75% of electricity generation capacities is installed in hydropower plants. So far, two large-scale hydropower plants are constructed – HPP Perućica and HPP Piva - and seven small hydropower plants.

**HE Perućica**

Hydropower plant „Perućica“ has its accumulation-derivative facilities constructed nearby Glava Zete, using watercourses of Nikšić field. The catchment of Nikšić field covers the area of 850 km² in topographic terms, while the catchment itself covers 1.170 km². The main watercourse in Nikšić field is Zeta, with its 20 km flow, having left confluents of Gračanica, Mrkošnica and Grabovik, and right confluents of Opačica, Moštanica and several other watercourses. Measuring the water level, i.e. the level of Zeta water flow in Nikšić field, has been carried out in hydrologic section „Duklov most“ ever since 1929.

HPP Perućica is using water flows of Gornja Zeta catchment, which affects Nikšić field, having gross decline of approximately 550 meters. With the concept design and approved technical-economic documentation, construction of HPP Perućica has been anticipated in four phases, each one constituting the separate unit. So far, three phases have been implemented.

The first phase (1960) include construction of all generators and flumes, the first pipeline, switchyards of 110 kV, gutter and engine building with generators I and II having capacity of 38 MW each and installed flow of 8,5 m³/s. In the second phase (1962), second pipeline and generators III, IV and V have been constructed, each having capacity of 38 MW and installed flow of 8,5 m³/s. In the third phase (1977/78), third pipeline and generators VI and VII have been constructed having capacity of 58,5 MW and installed flow of 12,75 m³/s each. In the fourth phase it is planned to construct generator VIII, whose gutters and flumes were constructed in the previous phases, as well as ancillary and joint facilities, including space in the engine building. All generators are equipped with Pelton turbines. Following realization of the third phase, the total installed capacity of all generators is 307 MW, with total installed flow of 68 m³/s.

Hydro-energy system of HPP Perućica is characterized by number of facilities of large-scale dimensions (total length of dams is 6 km, length of flumes over 20 km, tunnels under pressure of 3,5 km and pipelines under pressure of 3×2 km). Furthermore, facilities are spread over 30 km, in craggy area, which posed different problems in the course of construction and exploitation.

Record electricity generation was reached in 1996, amounting to 1.356 GWh. Minimum generation from 1978 (since the last generator was installed) to 2005 was recorded in 1993 amounting to 539 GWh. The average annual generation in the model is 958 GWh.
Generation is almost fully dependant on hydrological situation, which can significantly vary in different years. During the period when all 7 installed generators were operating, i.e. with the full capacity of 307 MW, number of problems occurred, namely those related to gutters, water supply to the input structures, leakages in pipeline no. 3, etc. Due to the insufficient capacities of input and output pipes (according to the Project on revitalization and modernization of HPP Perućica from 1984), and based on analyses carried out in ’80 and ’90, capacities of the power plant are limited to 245 MW, while the overall power analyses of HPP Perućica have been undertaken and amounts to 225 MW. In the period from 1991 to 1998, available capacity was 290 MW in the special regime. In October 1998, EPCG management reached a decision on decreasing available capacities to 260 MW. According to analyses carried out in April 2001, capacity of the power plant is limited to 285 MW, pursuant to the decision reached by EPCG. Documentation of EPCG and HPP Perućica foresees that available capacities by 2008 will reach 307 MW.

Project of revitalization and upgrading facilities of HPP Perućica and installing eighth generating unit is delayed for two years and the project presupposes that works will be completed by 2015. After this, total installed power would reach 387 MW, while the average annual generation would be 1.026 GWh.

**HPP Piva**

Hydropower plant Piva is a reservoir dam facility situated in Piva river, between mountains of Piva, Komarnica and Vrbnica. Initial geological works were carried out in 1964 and investment project in 1965. Until 1971, the main projects have been completed, while finalization of construction and starting operations of the generating unit took place in 1976. Due to the specific topographic features of terrain, the entire facility is placed under the ground level. Catchment area of HPP Piva covers 1.760 km², while the average annual flow in the dam section is 74,3 m³/s. Basic features of HPP Piva are the following:

- Installed power of generation units - 3×114 MW,
- The total storage capacity: 880 mil. m³,
- Installed flow: 3×80 m³/s,
- Foreseen annual generation: 860 GWh,
- Structural concrete arch dam having height of 220 m, hydraulic height of 190 m, arch length on the crown 268,56 m and arch length at riverbed 40 m.

Since starting its operations in 1976, HPP Piva is operating as the peak power plant in the energy system of Serbia, based on the exchange of electricity pursuant to the Agreement on long-term Cooperation renewed in 1991 and concluded for period of 25 years. In period 1976-1991, generation was valorized in ratio of 1:1.89 (through economic-financial valorization), while from 1991 this ratio was 1:1.415. According to this Agreement, the Energy Power Holding Company of Montenegro (EPCG) will each year deliver to the Electric
Security of Supply Statement of Montenegro

Power Industry of Serbia (EPS) guaranteed base load energy from HPP Piva, by observing requests and the needs of EPS, with possible average multi-annual generation of 765 GWh per year. Obligation of EPCG is to ensure operational readability of each of three generation units in HPP Piva throughout the entire period of the Agreement, expect at the time of overhaul and regular maintenance of the power plant. In return, the Electric Power Industry of Serbia will deliver to the energy system of Montenegro base load energy of 105 MW on annual basis and additional 105 MW, for period of 58 days, during the overhaul of TPP Pljevlja. This way, as valorization for generating peak energy in HPP Piva, EPCG receives 1 066 GWh of base load energy annually or approximately 1,41 kWh for each kWh generated in HPP Piva. The agreement envisages a possibility to amend this amount every five years, in the event of increased average annual generation of HPP Piva. In period 1977-2004, the average generation in HPP Piva was 739,5 GWh. The peak generated power was 1 029 GWh (1979), while the lowest was 426 GWh (1990). The average generation is lower than planned (860 GWh) for 14%, which is a consequence of unfavorable hydrological conditions, i.e. less inflow into the accumulation than anticipated. Apart from this, operations of the power plant were not always at the optimal level, recording overflow in certain years while the power plant management did not adequately use the optimal elevation point of the lake necessary for achieving the maximum generation power (114 MW).

Small hydropower plants

In the past, seven small hydropower plants were constructed in Montenegro and today these are the ownership of Energy Power Holding Company of Montenegro. These hydropower plants are the following: Glava Zete, Slap Zete, Rijeka Mušovića, Šavnik, Rijeka Crnojevića, Podgor and Lijeva Rijeka. The oldest one is HPP Podgor, constructed and operational from 1939, while the newest one is HPP Lijeva Rijeka, operational as of 1987. Table 10.2 presents technical features of small hydropower plants.

<table>
<thead>
<tr>
<th>River</th>
<th>Glava Zete</th>
<th>Slap Zete</th>
<th>Rijeka Mušovića</th>
<th>Šavnik</th>
<th>Lijeva Rijeka</th>
<th>Podgor</th>
<th>Rijeka Crnojevića</th>
</tr>
</thead>
<tbody>
<tr>
<td>River</td>
<td>Zeta</td>
<td>Zeta</td>
<td>Levaja</td>
<td>Šavnik</td>
<td>Grb dol</td>
<td>Oraoštica</td>
<td>Rijeka Crnojevića</td>
</tr>
<tr>
<td>Turbine power (kW)</td>
<td>2×2680</td>
<td>2×600</td>
<td>3×420</td>
<td>2×100</td>
<td>55</td>
<td>395</td>
<td>555</td>
</tr>
<tr>
<td>Turbine type</td>
<td>Kaplan (vert.)</td>
<td>Kaplan (vert.)</td>
<td>Pelton (horiz.)</td>
<td>Francis (horiz.)</td>
<td>Banki</td>
<td>Michell Ossberger</td>
<td>Michell Ossberger</td>
</tr>
<tr>
<td>Flow (m³/s)</td>
<td>2×14,5</td>
<td>2×13</td>
<td>3×0,35</td>
<td>2×0,5</td>
<td>0,22</td>
<td>0,9</td>
<td>3,0</td>
</tr>
<tr>
<td>Useful decline (m)</td>
<td>21,5</td>
<td>7</td>
<td>160</td>
<td>26</td>
<td>40,8</td>
<td>54</td>
<td>22,7</td>
</tr>
<tr>
<td>Generator power (kW)</td>
<td>2×3200</td>
<td>2×1200</td>
<td>3×650</td>
<td>2×100</td>
<td>110</td>
<td>465</td>
<td>650</td>
</tr>
<tr>
<td>cosφ</td>
<td>0,7</td>
<td>0,8</td>
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<td>0,8</td>
<td>0,87</td>
<td>0,8</td>
<td>0,8</td>
</tr>
</tbody>
</table>

At the beginning of its operations, HPP Rijeka Mušovića, HPP Slap Zete and HPP Glava Zete were the main source of electricity in Montenegro. HPP Rijeka Mušovića covered consumption of the north region of Montenegro, operating together with EES Serbia, while hydropower plants Slap Zete and Glava Zete were suppliers of central and south region of
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Montenegro. Following construction of the large-scale hydropower plants in Montenegro (HPP Peručica, HPP Piva and TPP Pljevlja), small hydropower plants ceased to be the primary source of electricity, since their overall generation represents only the small share in the overall energy balance of Montenegro.

All of the seven small hydropower plants are, according to their characteristics are flow HPPs. Their total installed power is 9,025 MW, while the anticipated annual generation is 21 GWh.

**Thermo power plant Plevlja**

Thermo power plant Plevlja is the first Montenegrin condensation thermo power plant, initially designed to have two blocks of 210 MW each. Water accumulation, including all ancillary, technical, management and administrative facilities (except de-carbonization and recirculation cooling system) were made for two blocks, although only one block is built so far. Construction of the first block of TPP Pljevlja took place from 1976 to 1982. The first network synchronization was conducted on 21 October 1982.

TPP Pljevlja complex consist of the following components:

- Developed location with accompanying infrastructure,
- Prime engine facility (boiler-room and engine building),
- Landfill and coal supply,
- Storage and pump station for fuel oil,
- Side boiler-room,
- Electrolyses station for hydrogen,
- Chemical water processing (HPV),
- Excavator station with electro-filters and a rectifier station,
- Chimney,
- Cooling tower with cooling water pump station and backflow water system,
- „Otilovići“ accumulation with crude water pipeline to TPP,
- System for ash and cinder drainage, including landfill „Maljevac“,
- Workshops, storages, administrative and management building.

Due to the planned construction of two blocks of 210 MW each, most of the common facilities were constructed so to fit operations of both blocks (location, water supply, landfill and coal supply, fuel oil storage, chimney, electrolytic station, demineralization and HPV, ancillary buildings). This provide for savings and significant reduction of time needed for eventual future construction of the second block.

Supply of TPP Pljevlja with cooling water and water for other needs is done through „Otilovići“ accumulation, having volume of 18 million m³, located in river Ćehotina, 8 km from thermo power plant. Accumulation dam is concrete arch shape, having height of 59 m. The main thermo power plant equipment is supplied by „Tehnopromet-eksport“ from Moscow. First phase of reconstructing boiler facility is carried out in 2003, having in mind that initial construction of the facility did not match features of coal from Pljevlja.
TPP Pljevlja with installed power of 210 MW operates as a base load station in the system, projected to operate 6,000 hours per year, which along with the maximum capacity at the threshold of 191 MW gives the anticipated maximum annual generation of 1,146 GWh. The average generation in 2002-2004 was 1,043 GWh, which is 24% of total generation in Montenegro or approximately 33% of the overall generation at the territory of Montenegro in the same period. In the annual energy balance of Montenegro, TPP Pljevlja participates with 1,073 GWh. Position of TPP Pljevlja in the system of Montenegro is very important, and its role is also important from the point of view of quality of electricity and stability of Montenegrin EES. Table 2.5 presents realized generation of TPP Pljevlja from the beginning of its operations till today.

4.4. Energy infrastructure from the aspect of transmission network

The transmission network in Montenegro is characterized by its mostly radial structure on all three voltage levels and a good connection with the neighboring electric power systems of Serbia, Bosnia and Herzegovina and Albania. Adequate connection of the transmission network of Montenegro with neighboring systems additionally increases reliability of the electric power system (EPS) of Montenegro and enables a significant level of exchange among the surrounding system, although this also exposes transmission network to a considerable transit of electric power.

The transmission network of Montenegro consists of 20 substations of total installed power capacity of 3224.5 MVA, out of which 1400 MVA share (43.41%) in 400 / x kV transformer (400/220 kV and 400/110 kV), 575 MVA (17.83%) in 220/110 kV transformer and 1059.5 MVA (38.76%) in 110/kV transformer (110/35kV and 110/10kV). The substations were mostly constructed during the period 1950 and 1980, while the TS 110/35kV, 2x20MVA Virpazar was built in 2009 and became operational in 2010. The substations are linked with transmission lines of a total length of 1356.7 km (-284.3 km 400kV, 220kV - 110kV 348.1km and -724.3 km).

The downside of the transmission network of Montenegro concerns the parallel lines of 400kV and 220kV whose transmission capacity is unequal (1330 MVA per line in the 400 kV network as opposed to 301 MVA per line in 220 kV network), so that in case of a breakdown in some particular sections of the 400kV network and particular operating conditions certain parts of the 220kV network become overloaded, which may cause the system to collapse.

The 110kV network is not interconnected in the entire territory of Montenegro. TS Pljevlja 1 of 110/35kV, located in the North, is supplied through TS 400/220/110 kV Pljevlja 2, and is also connected with TS Potpeč in Serbia and TS Gorazde in Bosnia and Herzegovina (the delivery line operates under 35kV). The northeastern part of the 110 kV network consists of the leg Bijelo Polje - Berane - Andrijevica - SS Trebješica, partly supplied via TS 220/110kV Pljevlja and partly via TS 220/110kV Podgorica. The Coastal region is supplied from TS 400/110kV Podgorica 2 (by power lines Podgorica 2 - Bar and Podgorica 2 - Budva, Podgorica 2 - Cetinje - Budva) and via TS 400/220/110/x kV Trebinje (by 110kV power line Trebinje - Herceg Novi). The TS 110/35 kV Danilovgrad is located in the West and it is supplied from Podgorica 1 and also connected with TS 110/35kV Niksic, which used to be supplied from the TS 220/110kV Peručica.

The main issues relating to secure and reliable electricity supply to customers concern the following:
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- Radial power supply to the customers in Kotor, via a 35kV power line Tivat-Kotor, which places Kotor (a city of approximately 25,000 inhabitants and 13,000 customers) among the areas of most unstable electric power supply in Montenegro;
- Radial power supply of customers in Ulcinj, via a 110kV power line Bar - Ulcinj;
- Unreliable power supply of the Northeast part of Montenegro, that is the customers supplied form the following transmission substations:
  o TS 220/110/35 kV Mojkovac;
  o RP 400 kV and 110/35 Rlbarevina (Bijelo Polje)
  o 110/35 kV Berane, and
  o 110/35 kV Andrijevica.

The main reason for such unreliable power supply lies in the fact that any breakdown of the transmission line of 220 kV Podgorica 1 - Pljevlja 2, tha TS Mojkovac is connected to via »T« connection, automatically results in failure of the transformer 220/110 kV 150 MVA in TS Mojkovac, which in turn causes an overload of the power line of 110 kV Podgorica 1 - Trebješica - Berane and problems in supply of Mojkovac and Kolašin.

On the other hand, any breakdown of the 110 kV power line Podgorica 1-EVP Trebjesica - Berane (built in 1960, 81.6 km in length and whose route passes through a very difficult terrain to maintain) lefts TS Andrijevica without power, as well as all consumers who are supplied from this power line, until the breakdown is located and removed. Supply of consumers in this area from the 35kV network is NOT POSSIBLE, because after the great damage to the 35 kV power line Berane (Rudeš) - Andrijevica which happened in 1986 it was assessed that this power line is not worth of fixing, so this area cannot be supplied anymore from the 35 kV network from the side of Berane.

A significant number of 35 kV power lines (maintained and owned by the Electric Power Company of Montenegro), that were once used to support the neighboring power distribution areas in this region, are no longer operational, so those cannot be used to mitigate the effects of absence of the elements of the mentioned transmission network components.

These are the following 35kV power lines:
  - Vrulja – Čokrilje (no possibility of support between Pljevlja and Bijelo Polje);
  - Šćepanica – Berane (no possibility of support between Bijelog Polja and Berane);
  - Mojkovac – Slijepač Most (no possibility of support between Mojkovac and Bijelo Polje);
  - Berane – Andrijevica (no possibility of support from Berane to Andrijevica).

In order to ensure quality and more reliable power supply of customers based on an analysis and monitoring of power demand increases and interruptions in electricity supply, the following substations and power lines are currently under construction by the CGES:

Facilities constructed and put into operation during 2009 and 2010:

- TS Virpazar of 110/35kV, 2x20MVA and to be connected to the transmission network via the transmission line 110kV Podgorica 2 –Bar, according to the principle "input-output". The value of this investment amount to 2.5 million Euros, while the facility was put into operation in October 2009.
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- Power line 400kV Podgorica 2-Albania, improving the interconnection between the EES of Montenegro and the neighboring systems. The value of this investment is €14,000,000.00 EUR, while the facility was put into operation in 2010.

Implementation of the ongoing projects:

- TS 110/35/10kV, 2x20MVA Kotor (Škaljari) and 110kV power line Tivat – Kotor, connecting the substation of Kotor to the transmission network. The value of the investment is 3,100,000.00 EUR, while it is due to be completed completion by the end of 2012.
- TS 110/10kV Podgorica 5 including a 110kV power line Podgorica 5 - T connection KAPI and 110 kV cable line Podgorica 3 - Podgorica 5, in addition to the expansion of TS 110/10 kV Podgorica 3. The value of the investment amounts to 9,000,000.00 EUR, and the deadline for completion of the TS 110/10kV Podgorica 5 with power line 110kV Podgorica 5 - T connection KAPI by the end of this year, and for the expansion of TS 110/10 kV Podgorica 3 and 110 kV cable line Podgorica 3 - Podgorica 5 until the end of next year.
- Expansion of the existing distribution facility of 400kV Ribarevina by installing a transformer of 400/110kV, 150mV, which will ensure a more reliable and safer electricity power to the Central and Northeast regions of Montenegro. The value of this investment amounts is 4,000,000.00 EUR. Works on the project are in final phase and it is currently being tested.
- Expansion of TS 220/110/35kV Mojkovac by constructing a new 220kV facility to be connected to the transmission network via the 220kV power line of Podgorica 1 – Pljevlja 2, according to the principle “input-output”. The value of this investment amounts to 1,476,635.00 EUR, while it is due to be completed in July 2012.
- Expansion of TS 110/35/10kV Andrijevica by constructing a new facility of 110kV and connecting it to the power line of 110kV Podgorica 1 - EVP Trebišješica – Berane, according to the principle “input-output”. The value of this investment amounts to 1,664,282.20 EUR. Works on the project are in final phase and it is currently being tested.
- Replacement of the existing protection rope on the power lines with cable OPGW. The value of this investment is approximately 10,000,000 EUR, while the deadline for the completion of works is October 2010.

According to the Development Plan, AD Prenos plans to make additional investments into its network infrastructure, relating to the construction of a submarine cable between Montenegro and Italy.
Figure 2: scheme of the current electric power system of Montenegro

Figure 3: Map of the geographical spread of electric power facilities
4.5. Energy infrastructure from the aspect of distribution

For the purpose of global overview of the type and electric energy facilities used for distribution under the competence of the FC Distribucija, we will use summary data (data submitted for distribution licence and ODM):

- 35/10 kV TS items 87
- 10 kV facilities within TS 110/10 kV items 2
- TS 35/0.4 kV and TS 35/0.6 items 24
- TS 10/0.4 kV items 1732
- STS 10/0.4 kV items 1987
- 35 kV overhead lines km. 1028
- 35 kV cable lines km. 48
- 10 kV overhead lines km. 3544
- 10 kV cable lines km. 997
- 0.4 kV overhead lines km. 11542
- 0.4 kV cable lines km. 1394

The structure of facilities, regardless of their respective conditions, indicates very clearly that the concept of this distribution network is technologically outdated. Customers' demand in terms of energy needs, maximum power and safety of supply, imply an application of other solutions relating to the development of high-voltage network.

Introduction of 110 kV cables in distributive consumption centres, their interconnection and direct transformation by application of modern technical solutions represents a preference and the only right choice for all power distribution units. This approach to development projects was adopted already during the 1980s, when two substations TS 110/10 kV Titograd III and Titograd IV, and overhead lines 110 kV Smokovac – Tuzi, DV 110 kV Kolašin – Mojkovac and DV 110 kV Ribarevine – Nedakusi, Pljevlja – Žabljak, Kličevo – Brezna, and Berane – Rožaje were constructed, and they have been operating under the 35 kV voltage level.

All high-voltage power distribution facilities which have been constructed after the mentioned period of time do not relate to development, but only an extension of the existing 35 kV network. Such solutions are cheaper, although not far-reaching in terms of the future. Following the construction of new 35 kV cables, some local bottlenecks were resolved to ensure power supply to the existing or new 35/10 kV facilities and possibly some reserve supply. Nevertheless, the development of a 35 kV network additionally complicated the operation of the existing 35 kV network in terms of an increase in non-compensated power for earth wiring, because the 35 kV networks, except in the area covered by the Power Distribution Units of Tivat and Podgorica, operate as a separate system. On the other side, the existing transmission facilities – 110/35 kV transformers are additionally loaded.

Since the 110 kV network does not fall under the competence of the distribution function, while typically distribution facilities 110/10 kV only partly do (10 kV facilities), the power distribution component of the Electric Power Company of Montenegro (EPCG) is carried out via the 35 kV network, medium-voltage – 10 kV and low-voltage network.

The primary distribution network's nominal voltage amounts to 35 kV, mostly consisting of overhead lines, more than 90 %, while the remaining part of the network consists of underground cables located mostly in the towns of the central and coastal region of the Republic. The overhead network is mostly already amortized, not offering an adequate operating reliability. The cable network is not unified in terms of the existing cable types and
categories. The 35 kV network operates under a regime of insulated neutral end, although in particular sections of the network no such regime should be tolerated.

Nominal voltage of the medium-voltage network amounts to 10 kV. The overhead network is mostly mounted on wooden poles and makes 80 % of it in total. The number of customers supplied by the overhead 10 kV network is inversely proportional to its size, since it is exclusively used to supply power to suburban and rural areas. The 10 kV cable network is not unified, while its configuration by default is based on a previously established concept.

The low-voltage network, as the most extended peripheral part of the distribution system, due to its size and importance, represents the basic object of activities in all distribution centres in terms of running and investment maintenance. Its quality is uneven, while a long-term reliability is hard to achieve due to constantly changing parameters of the demand. The main issues relating to the maintenance of medium and low-voltage networks concern the detection of line faults and pole replacements. A high number of crews, vehicles, machines and tools have to be engaged for the maintenance of low-voltage and 10 kV overhead power distribution networks on daily basis, in addition to high quantities of replacement parts, primarily the poles.

Over the previous 10-20 years, no investment activities relating to the primary network could be regarded as development activities, but only as local extension of the existing installations. This is when a significant number of 10/0,4 kV facilities was constructed, including the accompanying medium and low-voltage connections and fittings.

This shows that the distribution system, and first of all its primary component, operates at a very low level of operating reliability.

Concerning the status of its neutral end, the 35 kV network operates as a separate system, except for the distribution areas covered by the Power Distribution Units of Tivat and Podgorica. The earth wire currents are above the permitted values. Due to this fact, the operating reliability of the network is additionally and significantly reduced resulting in frequent and massive damages to the facilities, and especially the most expensive parts, transformers, switches and cables.

The 35 kV network is controlled in accordance with the technical solutions applied during the first phase of electrification. The network is controlled by duty dispatcher who issues orders to the fitters in manned facilities.

The systems for remote control and monitoring of the network were installed by the PDU Ulcinj and to some extent by the PDU Podgorica. These systems were commissioned end of the 1980s, and from the aspect of modern technologies such solutions are already outdated.

In addition to two 10 kV facilities constituting a part of the 110/10 KV Podgorica II and Podgorica IV, the distribution system includes another 87 35/10 kV facilities.

Electric power and energy losses have always been high in the power distribution network.

Most of technical losses (constant and inconstant), that otherwise have a smaller share in total losses, are inevitable.

The structure of losses is dominated by non-technical (or the so-called commercial losses), which is caused solely by the human factor, and are mostly attributed to the end-component of the power distribution network – electricity meters, unless a classical method of stealing is applied where an electricity meter is bypassed by connecting the appliances directly either to a distribution or service connection cable.
Possible directions of distribution network development until the year 2025 have been identified under the Energy Development Strategy of the Republic of Montenegro, the Study on 35 and 10 kV Distribution Network Neutral Points Grounding and partly the Study on Losses. The solutions recommended by these studies have been only partly implemented so far. However, since the distribution network has not developed sufficiently to keep pace with the power demand and customer requirements, the implemented investment activities have to be urgently analyzed in order to establish the priorities, first of all in the primary distribution network.

The condition of the distribution network obviously imposes an imperative need to engage in implementation of serious investment activities aimed at increasing the availability of the system and reduce the costs of demanding overhauls resulting from the lack of harmony between the capacity of the distribution system and customer demand.

The decisions on investment activities, especially the initial ones, must be preceded by a serious and analytical selection of priorities and recommended solutions.


The Master Plan envisages an investment into the distribution system amounting to 491 million EUR over the following 20 years, which is approximately EUR 25 million per annum.

The FU Distribution is currently conducting the following construction activities in order to ensure an improved quality and more reliable power supply to its customers:

- Reconstruction of TS 35/10 kV Bistrica, TS 35/10 kV Humci, TS 35/10 kV Baošići, TS 35/10 kV Petrovac, TS 35/10 kV Škaljari – French Government’s loan.
- Reconstruction of a 10 kV in TS 110/10 kV Podgorica 3 – French Government’s loan.
- Installation of 10 kV cable connections in TS 110/10 kV Podgorica 5 – credit of the KfW Bank.
- A system for remote reading of meters will be an extension of the Pilot Project covering 4000 meters, which was funded by the World Bank and had excellent results relating to a reduction in losses and increase in collection rates. An upgrade of the system is planned, including installation of 60000 meters, reconstruction of low-voltage network and repairing of customer meters.
- Construction of the 35 kV power line Cetinje - Podgorica (17,5 km) in order to improve electricity supply to the water source of Podgorica (supplies water to the municipalities of Cetinje and Budva).
- Preparatory activities relating to the distribution network on the coast in order to ensure higher-quality power supply during summer season.
- Activities to maintain the operational readiness of distribution facilities.
Graph 4: Single-pole diagram of transmission and distribution network (35 kV)

aph 5: Geographic map of the 35 kV network (single-pole diagram)
4.6. Electric energy infrastructure from the aspect of power generation

Elektroprivreda Crne Gore AD Nikšić is the only company in Montenegro engaged in electric power generation.

FU Generation, as a part of the Elektroprivreda, is responsible for electric power generation, including a group of hydro and thermal power generation facilities with 868 MW of total installed power generation capacity.

The contribution of each power generation facility to the installed power generation capacity of the FU Generation is shown in the table below:

<table>
<thead>
<tr>
<th>POWER PLANT</th>
<th>INSTALLED CAPACITY</th>
<th>Year of commissioning</th>
<th>Average generation 2002 - 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MW</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>HPP “Perućica”</td>
<td>307</td>
<td></td>
<td>1960.</td>
</tr>
<tr>
<td>HPP “Piva”</td>
<td>342</td>
<td></td>
<td>1976.</td>
</tr>
<tr>
<td>SHPP (Distributive)</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL HYDRO POWER PLANTS</td>
<td>658</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>TPP “Pljevlja”</td>
<td>210</td>
<td>24</td>
<td>1982.</td>
</tr>
<tr>
<td>TOTAL HPP + TPP</td>
<td>868</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Coefficients of availability achieved in 2010 are lower than usual due to longer refurbishments of power plants. Reliability coefficients are relatively high, except for TPP “Pljevlja” due to unexpected delays which resulted from the commissioning of new equipment and malfunctioning of the boiler.

Individually, power plants have achieved the following availability coefficients:

- HPP “Perućica” ------------ 89.5 %,
- TPP “Pljevlja” ------------ 83.9 %, and
- HPP “Piva” ------------ 84.6 %,

and the following reliability coefficients:

- HPP “Perućica” ------------ 99.7 %,
- TPP “Pljevlja” ------------ 92.4%, and
- HPP “Piva” ------------ 99.3 %.
The EPCG pays full attention and respects the fact that a strategic management of the power generation process is the condition for enabling safe, reliable and environment-friendly electric power supply to Montenegro on long-term basis. Even more so given the fact that Montenegro is facing deficit of electric energy.

Consequently, due to the fact that almost all power generation facilities are nearing the end of their respective operating lives, it is required to have an integral strategy for the maintenance and increase of the current electric power generation, and this strategy will be used as the basis for reviewing and establishing measures, both present and future, to be undertaken with the objective of revitalization and full employment of the existing capacities, in addition to the construction of new facilities where the conditions have been or may be created with respect to unemployed natural potentials and spatial capacity.

According to the foregoing, an overview of the initiated activities and conducted works is presented in the text below, in addition to future works to be carried out with the objective of implementing the strategy of sustainable power generation and output increase, in agreement with economic, social and spatial aspects. Each component of the FU Generation is addressed separately.

**HPP “Perućica”**

HPP “Perućica” has been operating since 1960, and some of its equipment, facilities and plants are nearing the end of their technical life, while most of them, some of which have protective functions and functions needed for safe operation of the power plant, are out of use and impossible to repair, reconstruct, upgrade or replace.

The power plant has seven generators of total installed power of 307 MW, but at the time of the formulation of the programme, it operated at 245 MW or 80% of its capacities primarily due to inadequate input and output components.

In order to address these issues, formulation of the programme of modernization, development and upgrading of the HPP “Perućica” started in August 1983, as well as drafting of technical documents.

**Modernization Programme** included all the necessary works on revitalization and modernization of the power generation process, bringing equipment, plants and facilities to the level with lower risk of disasters, better safety at work, better operational readiness and guaranteed current generation of the HPP “Perućica” for the next amortization period and technical life cycle. This Programme also includes works related to integrating of power plants into the technical management system of the Electric Energy System.

**Rehabilitation Programme** included all necessary works enabling the power plant to generate energy with already installed 307 MW, instead of 245 MW, and thus provide for the new, additional generation of electricity of minimum 39.3 million kWh a year. Planned works should provide for a safe start and sudden changes in the plant’s power, ensure the required water volume by regulation as required for the system of secondary regulation of the strength of power frequency, and prevent the water losses due to sudden dropping of the plant’s power or in case it stops operating.
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Due to inadequate input and output systems, followed by outdated existing electric and mechanical equipment and a lack of modern integral power plant management system (integration of obtaining of data, monitoring, regulation, protection functions, etc.), operating the power plant at higher power is highly risky.

**Upgrading Programme** included installation of the eighth generator of 58.5 MW, which would enable achieving installed power of the power plant of 365.5 MW, and new additional production of electric energy of approx. 20 million kWh/year.

**Phase I of Modernization and Rehabilitation Programme** included the most urgent construction works on the compensation reservoir, canals Zeta I and Zeta II and the building of the power plant, reconstruction of electric and mechanical equipment running on four generators 40 MVA, reconstruction of electric and mechanical equipment running on two generators 1MVA of own consumption, reconstruction of electric equipment, facilities of own consumption and the start of the construction of Integral Information System.

A number of research studies, analyses, designs, etc. has been prepared for the hydro power system of Gornja Zeta and HPP "Perućica" addressing the possibility of increasing electric power generation at HPP "Perućica", both through reconstruction and refurbishment and rehabilitation of the system. The text below mentions projects and measures that have been or need to be undertaken in that direction.

Until now, the hydro mechanical and electrical equipment of 4 out of 7 generators has been reconstructed and it can be stated with certainty that those facilities, after this refurbishment, will be able to sustain another power generation cycle at the level of 40 MW, which is higher by 2 MW per unit than before the refurbishment.

An overview of other activities at the HPP "Perućica" aimed at extension of the power generation process and maximum use of the existing capacity is shown below.

**Upgrading Programme for Generator 8**

The Concept Design and investment documents for programmes of modernization, development and upgrading of the HPP “Perućica” included the development of technical designs and energy, economic and financial analyses aimed at reviewing justification for their construction.

Development of technical designs started from the assumption that the programme of modernization and development of the HPP “Perućica” would implement solutions needed for operation of the power plant at 307 MW, or for safe operation at any power rate (elevation of the canal and compensation reservoir is envisaged for the flow of 81.75 m3/sec, and for generator 8).

Consequently, this limits the programme of upgrading of generator 8 to procurement and installation of equipment and construction works in the power plant itself.

Updating of energy and economic-financial analyzes in underway in relation to feasibility of installation of the eighth generator. These analyses should be used by Elektroprivreda of Montenegro as the grounds for making final decision on installation of the eighth generator.

HPP “Piva” has been operating since 1976 with three generators of total installed power of 342 MW, and has a significant role in the power generation system of the EPCG. Considering its age, the HPP “Piva” has to be reconstructed whereby its operating reliability
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and availability would be increased and the service life of its particular facilities extended, simultaneously with a reduction in power generation costs and possible increase in power generation.

**Reconstruction of HPP “Piva” and possible increase in power generation**

The project of reconstruction and modernization of the HPP “Piva” was initiated in 2004 to be implemented in phases. The objective of this Project is to have the entire equipment and building structures of the power plant reconstructed, and especially the following: turbines, power generating units, transformers, the 220 kV equipment, own power consumption, telecommunication system, protection, metering, control, input and output facilities, hydro mechanical equipment, dam, absorption basin, mechanical structure.

**Phase I** of revitalization included the following: replacement of generator inductors, installation of electrical brake system, replacement of high-voltage switches and dividers in the distribution facility 220.

**Phase II** of revitalization and improvement of power generation capacities started in March 2008 when the preparatory works for the development of a feasibility study and concept design were initiated.

Consultancy services have been contracted out to Colenco and Energoprojekt companies, and funds are provided under financial support of the KfW Bank.

One of the main tasks of the Consultant is to analyze existing and future operating conditions of the power plant and its role in the system whereby current characteristics of generators will be taken into account and possible improvements given their efficiency and operation in the future conditions.

Following an overall testing of the equipment and facilities and obtained results, in addition to the preparation and analysis of a number of studies, a Feasibility Study and the Concept Design will be prepared by the consultant.

The Study shall, inter alia, assess the feasibility of replacement of the turbine circuit and the reconstruction of generators or the entire generator equipment in order to increase the power and generation capacity of the power plant.

Only after the Concept Design and the Feasibility Study have been prepared and approved by the EPCG and KfW, further actions relating to the facility and equipment will be identified, including activities related to increase in power generation.

An increase in power generation by the HPP “Piva” may be competently discussed in terms of precise quantitative data only following the completion of the foregoing studies and preparation of project documentation.

Preliminary plan is to reconstruct individual generators in the period between 2014 and 2016.

It is planned that the Consultant submits final version of the Concept Design and the Feasibility Study before March 2012.

**The Project of lowering of tailwater level of HPP “Piva”**

Concept Design and the Feasibility Study for lowering of tailwater level of the HPP “Piva”, which was prepared by Energoprojekt – Hidroinženjering from Belgrade in October 2007, provide analysis of effects of deepening of the Piva riverbed, downstream from the dam from the aspect of augmentation of power generation.

Elektroprivreda of Montenegro plans to implement this project in 2012.
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This investment plans for increase of generation of electric energy by 19.7 GWh per annum, or 2.2% and the project implementation period of 5 months.

**Project for procurement of selected equipment**

Elektroprivreda of Montenegro decided to replace a part of hydro-mechanic and electric equipment of special importance for safe and secure operation of the power plant with the following new equipment:

- replacement and reconstruction of the main distribution substation 220V DC,
- replacement and reconstruction of electric protection of generators A1, A2 and A3, 120MVA
- replacement and reconstruction of the system of electric protection DV 220KV,
- replacement and reconstruction of metering transformers and collection stations in the 220 kV distribution facility,
- replacement and reconstruction of the equipment at entrance of generators A1, A2 and A3, 120MVA.

These activities are planned to be implemented in 2012 and 2013.

Funding is ensured under financial support provided by the KfW Bank.

**TPP “Pljevlja”**

The difference between installed and available power plant capacity is one of the indicators of cost-effectiveness of power generation. There may be a several reasons for this: inadequate technical condition of equipment, actual versus designed coal quality, operating regime, restrictions relating to the condition of environment, etc.

Such causes may be eliminated by various measures whose economic justifiability needs to be proven, so that the construction priorities may be identified accordingly.

a) Historical indicators of TPP Pljevlja’s operation

The installed capacity of the TPP Pljevlja is underused. Over the past five years, an average capacity of the TPP’s generator amounted to approximately 186 MW, with 166 MW threshold, and approximately 5,740 hours of operation per year. Average threshold power generation for the same period amounted to 952 GWh. Based on achieved availability and reliability of the block’s operation, the result could have been better with substantial economic effects.

b) Causes of active capacity deviation from nominal values

The causes of active capacity deviation from the nominal values are diverse:

- dominantly external (regime of the electric power system operation, quantity and quality of coal, open-air temperatures, etc.);
- internal (condition of equipment and technological systems; condition of the cooling system, etc.).
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The text below identifies specific issues and outlines measures for overcoming such issues.

c) Measures for better utilization of installed capacity

- modification of maintenance strategy and ensuring a quality maintenance and repair of the primary energy equipment;
- introduction of modern control technologies aiming to extend the service life and rebuild the resources of primary energy equipment;
- improving exploitation efficiency through modernization of the system of control and operation of technological processes;
- increasing annual power generation by increasing the number of hours of operation;
- supply, storing and delivery of coal;
- improving of boiler efficiency;
- improving exploitation indicators for turbine equipment.

d) Capacity increase options

The current capacity of the block may be increased by the following: increase in boiler steam generation and turbine steam flow, reconstruction and modernization of the turbine and system of control and operation, and also partly from the TPP’s own power generation.

Effects of this Project are as follows:

- extension of service life and higher reliability of the power plant; more hours in operation and a higher level of utilization of the installed capacity, i.e. higher power generation, lower costs of driving fuel and maintenance costs;
- increase in the installed capacity of turbo generators and its efficiency, as a result of reconstruction and modernization.

As a final effect of all planned activities in the TPP Pljevlja, the capacity of turbo generator is likely to increase by potential 19 MW, and the power generation by additional 400 GWh per year.

Regardless of the fact that implementation of the foregoing projects will create conditions for a significant increase in power generation by all three facilities, the issue of electric power deficit in Montenegro can be resolved only by the construction of additional large power sources, which is supported by the existence of considerable natural resources.
5. PRIORITY INFRASTRUCTURE PROJECTS AND THE MOST RECENT PROGRESS

In compliance with development orientations presented in the Energy Development Strategy of Montenegro until 2025, Action Plan for the implementation of the Strategy identifies projects of the highest priority for the energy sector of Montenegro. Important activities have been implemented in compliance with strategic orientations and under planned projects.

As for the **DV 400 kV Podgorica-Tirana** project, it implied the following activities:

- construction of the 400 kV power line from TS Podgorica 2 to the border with Albania (village Rola) around 29 km long -79 poles, and

- expansion of the TS 400/110 kV Podgorica 2 which implies construction of the new 400 kV DV field Tirana and reconstruction of existing 400 kV field Ribarevine.

Estimated value of the project implementation funded by the KfW in the territory of Montenegro amounts to 11.162.874,54 EUR, and the funds have been ensured as it follows:

<table>
<thead>
<tr>
<th>Funding</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donation</td>
<td>1.352.223,86</td>
</tr>
<tr>
<td>Credit under advantageous</td>
<td>910.150,68</td>
</tr>
<tr>
<td>conditions</td>
<td></td>
</tr>
<tr>
<td>Commercial credit</td>
<td>8.920.500,00</td>
</tr>
</tbody>
</table>

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The works were originally planned to be completed in November 2009, but due to addressing issues of ownership and legal relations, the works were delayed and finally completed in September 2010.

In January 2011, the Ministry of Sustainable Development and Tourism issued exploitation permits for DV 400 kV Podgorica - Tirana and the reconstructed TS Podgorica 2.

A section of the power line in the territory of Montenegro, and the belonging 400 kV DV field in TS 400/110 kV Podgorica 2, started its trial operation on 24.11.2010, and the entire power line with no connection to the TS Tirana 2 was commissioned idle on 26.01.2011. Since TS Tirana 2 has not been completed, consideration is being given to an opportunity to connect the power line between TS Podgorica 2 and TS Elbasan.

From the aspect of the development of gas infrastructure and market of gas in the region, the construction of Ionian-Adriatic gas pipeline is the project recognized by Montenegro as the project of fundamental importance for the construction of the future gas infrastructure, having in mind that Montenegro does not have access to international sources of gas.

Last year, Montenegro appointed its representative to the Inter-State Body established by members of the Energy Community that signed the Declaration on the Ionian-Adriatic Gas Pipeline in order to accelerate activities aimed at creating conditions for implementation of this important regional project.

The first meeting of this Body was held in Vienna on 25.11.2010 where the next steps were discussed. It was concluded that the first step and task was to prepare WBIF (Western Balkan Investment Framework) applications for drafting of the Feasibility Study and Environmental Impact Assessment for this project, and social matters as well.

The Government of Montenegro, Terna – Rete Elettrica Nazionale S.P.A (Terna) and the Shareholding Company Crnogorski elektroprenosni sistem (CGES) signed the following contracts end of 2010 and beginning of 2011: Agreement on Sale and Purchase by registering newly emitted shares under the procedure of capital enlargement, Strategic and Share Holding Agreement and the Agreement on Project Coordination in order to implement the Underwater Interconnection Cable Project for direct current between electric energy systems of Montenegro and Italy based on strategic partnership between operators of transmission systems.

After the recapitalization of CGES in January 2011, the Government remained the owner of 55% of share capital, while Terna purchased newly emitted shares of CGES under the procedure of capital enlargement and thus became the owner of 22,0889% and the strategic partner of the Montenegrin Transmission Company.

The Project envisages construction of the new 1000 MW electric energy interconnection between Montenegro and Italy – an underwater cable which is the responsibility of Terna (investment worth 758 mil EUR), construction of infrastructure which are internal to the Montenegrin transmission network by the CGES (network connections between the new interconnection link and existing 400 kV transmission network of Montenegro and the new 400 kV transmission line between Pljevlja and the Montenegrin coast, with the investment worth 100,28 mil EUR), and the construction of network infrastructure (new 400 kV interconnection line between Montenegro and Bosnia and Herzegovina and/or a new 400 kV
interconnection line between Montenegro and Serbia), which are important for optimum exploitation of the new interconnection system.

The underwater cable is planned to be completed by April 30\textsuperscript{th}, 2015, transformer stations on the Montenegrin coast by October 31\textsuperscript{st}, 2014, and 400 kV power line Pljevlja – Montenegrin coast by October 31\textsuperscript{st}, 2015.

**Project for Construction of HPP on Moraca**

Based on adopted strategic documents – Water Management Plan of Montenegro (2001), Energy Development Strategy until 2025 (2007), Action Plan 2008-2012 for the implementation of the Energy Development Strategy (2008), Spatial Plan of Montenegro until 2020 (2008), and a number of analyses, studies and documents prepared earlier, Elektroprivreda of Montenegro AD Nikšić, as the national electric company, and the Ministry of Economy started formulating the project for construction of hydro power plants on Morača through an international two-phased tender procedure for giving concessions. The International Finance Corporation (IFC) from Washington, a member of the World Bank Group and with extensive experience in implementing similar procedures in the world is the adviser to the entire tendering process.

On 25.02.2010, the Government of Montenegro adopted Prequalification Documents for HPP on Morača, and the Ministry of Economy published an Open Invitation for prequalification for concessions for hydro power plants on Morača on 26.02.2010, with 30.04.2010 as the deadline for submitting prequalification applications.

Based on prequalification criteria and requirements established by the Prequalification Documents and the documents on fulfilment of these criteria and requirements, the Tender Commission identified the following qualified Bidders:

1. Sinohydro Corporation Limited, China;
2. ENEL. S.P.A., Italy;

Tender Dossier allows qualified Bidders to submit Tenders based on the description of main technical designs I and II, which can be found in strategic documents of Montenegro and existing technical documents of EPCG AD Nikšić, and alternative technical designs if they think that such solutions are better from economic and environmental points of view compared to main technical designs I and II. Tender Dossier contains technical and financial criteria against which the Tender Commission will evaluate Tenders, whereby the highest number of points under evaluation of Technical Offers will be allocated for environmental criterion.

On December 15\textsuperscript{th} and 16\textsuperscript{th}, 2010, the Ministry of Economy and IFC organized a conference with qualified Bidders where they discussed the first round of questions and comments of qualified Bidders in relation to the Tender Dossier. The conference was held with representatives of ENEL and A2A-EPCG Consortium, while the other two qualified Bidders showed no interest in the conference or further tendering procedure.

Qualified Bidders are expected to submit their Tenders not later than 30.09.2011, and then they will be evaluated, the most successful Bidder will be selected, Detailed Spatial Plan and Strategic Environmental Impact Assessment will be adopted in compliance with the technical
design provided by the most successful Bidder (after public hearing has taken place), Concession Contract and the Agreement on Sponsor’s Support will be signed with the most successful Bidder and the financial structure will be defined. Once these preconditions have been put in place, the concession holder will launch the procedure for obtaining construction permit in compliance with legislation of Montenegro.

**Project for Construction of HPP Komarnica**

Preparatory activities for the implementation of the construction of HPP Komarnica Project have been launched based on the Energy Development Strategy of Montenegro until 2025, Action Plan for the implementation of the Strategy for the period 2008-2012, and other strategic documents which guide energy development in Montenegro. Existing technical documents prepared based on surveys conducted by EPCG and Elektroprivreda of Serbia over the past period, the plan is to build HPP Komarnica of installed power of 168 MW and annual generation of 232 GWh.

On June 17th 2010, the Government made a Decision on drafting of Detailed Spatial Plan for the area of multipurpose accumulation on the Komarnica River, and after this, “WINsoft” Ltd. Podgorica was selected in an open public procurement procedure to be the author of this Plan. The Contract signed on 08.12.2010 between the Ministry of Spatial Planning and Environment and the selected Author envisages that the Detailed Spatial Plan for the area of multipurpose accumulation on the Komarnica River is to be prepared in 12 months. Strategic Environmental Impact Assessment is planned to be prepared in parallel with the Detailed Spatial Plan. The Author of the Strategic Environmental Impact Assessment has been identified and signing of the contract is currently being prepared.

The following activities are planned to be implemented under the Construction of HPP Komarnica Project in 2011:

- Drafting and adoption of the Detailed Spatial Plan for the area of multipurpose accumulation on the Komarnica River and the Strategic Environmental Impact Assessment;
- Completion of surveys by the EPCG;
- Making Decision on the model of construction of the HPP Komarnica;
- Preparing inventory of real estates in the Komarnica basin;
- Drafting of Concession Act and Tender Dossier.

Activities related to drafting of the Concession Act and Tender Dossier will be implemented once the Detailed Spatial Plan and the Strategic Environmental Impact Assessment have been adopted, surveys completed by the EPCG and once the decision on the model of construction of HPP Komarnica has been made by the Government.

**Project for construction of small power plants**

Procedure of the II public tendering for selection of the investor to build small hydro power plants on 10 water courses was completed in 2010. Based on the results of this tendering procedure, another five concession contracts were signed in September 2010 for construction of small hydro power plants on five water courses. Based on submitted
technical designs, 10 small hydro power plants are planned to be built on these five water courses with total installed power 33 MW with planed annual generation of around 100 GWh. As per contracts, concessions will be implemented in three phases: Phase I implies drafting of technical documents; Phase II is the period of construction of small hydro power plants, and Phase III is the period of technical and economic exploitation of water energy potential for generation of electric energy in small hydro power plants. One concession holder has launched the procedure of obtaining approvals for construction permit, while others are waiting for the issuing of urban-technical requirements.

In addition, pursuant to the Law on Energy (“Official Journal of MNE”, no. 28/10), the Ministry of Economy prepared a separate procedure for construction of energy facilities which also includes construction of small hydro power plants of installed power of up to 1 MW on small water courses and annual gross energy potential of up to 15 GWh. This way, the Ministry competent for energy-related matters demonstrates its determination to improve environment for construction of facilities of renewable sources of energy, particularly in regards to construction of small hydro power plants. In November 2010, based on the procedure that has been established, the Ministry of Economy issued the first energy permit for the construction of a small hydro power plant of installed power of approx. 0.6 MW and total planned annual generation of 2.5 GWh. Investors, mostly Montenegrin, showed substantial interest in the construction of small power plants through this procedure and submitted additional 11 applications both for construction of new and reconstruction of previously constructed small hydro power plants. A standard Concession Contract which would be signed once construction permit has been issued will be discussed at the next session of the Government of Montenegro.

However, implementation of all these projects is dependant on the adoption of adequate spatial and planning documents. The Ministry of Economy integrates facilities of small hydro power plants into draft spatial-planning documents as they get drafted. For the purpose of quicker implementation of projects of small hydro power plants, the facilities of general interest, activities are being implemented in order to accelerate the procedure related to creating spatial-planning preconditions and issuing construction permits, both an national and local levels.

6. OIL DERIVATIVES IN MONTENEGRO

The 2011 energy balance related to oil derivatives has been prepared based on the turnover achieved in 2010 and real planning of consumption in the next year.

The supply of oil derivatives to consumers in Montenegro in 2011 will be performed by a number of oil companies which hold licences for selling and supplying oil derivatives and gas, in compliance with the Regulation on licences in energy sector of Montenegro (Official Journal of RMNE, no. 50/2004). In addition, some enterprises obtain certain quantities of oil derivatives through international tenders (Željezara Nikšić, Kombinat aluminijuma Podgorica, Directorate of Public Works, etc.).

The total turnover of oil derivatives for consumption in Montenegro in 2011 is planned to amount to 377,160.26 tonnes, which is by 16 % more than estimated consumption for 2010, and by 3% more than in 2009.
It is planned to increase the total turnover of all types of oil derivatives compared to 2010.

Estimated consumption of bitumen for 2011 is 5,500 tonnes and relates to the consumption plan of JPK and the implementation of the Programme of Public Works.

Planned needs of liquid oil gas in 2011 amount to 21,872 tonnes, which is by 32% more than the consumption in 2010, primarily due to higher use of liquid oil gas for motor vehicles.

**TABLE 5: Consumption of oil derivatives in Montenegro in 2009, estimation for 2010 and plan for 2011**

- in tonnes –

<table>
<thead>
<tr>
<th></th>
<th>Realized in 2009</th>
<th>Estimated realization in 2010</th>
<th>Plan 2011.god</th>
<th>Index (3/2)</th>
<th>Index (4/3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor oil LRP</td>
<td>25 241,2</td>
<td>20 525,4</td>
<td>-</td>
<td>0,81</td>
<td>-</td>
</tr>
<tr>
<td>Motor oil BMB 98</td>
<td>-</td>
<td>-</td>
<td>11 555,0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Motor oil BMB 95</td>
<td>56 545,0</td>
<td>51 190,7</td>
<td>65 689,0</td>
<td>0,90</td>
<td>1,28</td>
</tr>
<tr>
<td>Aviation fuel GM-1</td>
<td>450,8</td>
<td>108,0</td>
<td>180,0</td>
<td>0,23</td>
<td>1,66</td>
</tr>
<tr>
<td>Eco-diesel</td>
<td>77 804,8</td>
<td>77 953,8</td>
<td>163 262,0</td>
<td>1,00</td>
<td>2,09</td>
</tr>
<tr>
<td>Heating oil</td>
<td>35 160,7</td>
<td>35 264,2</td>
<td>45 891,2</td>
<td>1,00</td>
<td>1,30</td>
</tr>
<tr>
<td>Crude</td>
<td>35 490,4</td>
<td>10 420,0</td>
<td>17 250,0</td>
<td>0,29</td>
<td>1,65</td>
</tr>
<tr>
<td>Bitumen</td>
<td>2 500,0</td>
<td>3 662,6</td>
<td>5 500,0</td>
<td>1,46</td>
<td>1,51</td>
</tr>
<tr>
<td>Lubricants, oil and other derivatives</td>
<td>881,0</td>
<td>777,0</td>
<td>777,0</td>
<td>0,88</td>
<td>1,00</td>
</tr>
<tr>
<td>TNG</td>
<td>14 424,1</td>
<td>16 466,0</td>
<td>21 872,0</td>
<td>1,14</td>
<td>1,32</td>
</tr>
<tr>
<td>Petrol-coke</td>
<td>22 561,5</td>
<td>33 245,0</td>
<td>45 184,0</td>
<td>1,47</td>
<td>1,35</td>
</tr>
<tr>
<td>TOTAL</td>
<td>364 513,4</td>
<td>324 937,9</td>
<td>377 160,2</td>
<td>0,89</td>
<td>1,16</td>
</tr>
</tbody>
</table>
6.1. Perspective and plans of oil sector

Recent report of the Energy Community on the analysis of energy sector titled: “Emergency oil reserves in the Energy Community” offers a rather good insight into oil sector of Montenegro. In addition, discussions and meetings held with representatives of the Ministry of Economy, Energy Sector and main actors on the oil market in the country have contributed to improved knowledge and better understanding of the oil market in Montenegro, oil storage capacities in particular.

Montenegro does not have capacities for processing of oil and is fully dependent on import of oil derivatives although there are positive prospects for local oil fields undergoing exploring of capacities and sustainability. Consumption of oil derivatives in 2009 amounted to around 364,000 tonnes of oil equivalent which is mostly consisted of gas / diesel fuel (55%) and petrol (20%). Consumption of crude has dropped due to lower consumption by Kombinat Aluminijum KAP. Economic crisis affected demand for all oil derivatives in the last couple of years.

There are several oil companies with significant capacities and turnover, and the most important is Jugopetrol, owned by Hellenic Petroleum. This company has almost half of the reservoir and significant storage capacities. The total storage capacity of Montenegro is around 210,000 m³ and comprises a number of smaller reservoirs and medium-size reservoirs mostly located in Bar, Lipci and Bijelo Polje. The reservoirs which are functional are used only for commercial purposes of companies; consequently, only a smaller part of existing capacities is operational and most of unused capacities require substantial investments and maintenance.

Current needs of storage capacities in terms of the obligation of maintaining of 90-days reserves, in compliance with the EU calculation methodology, for this country amount to 90,000 – 100,000 m³ and not expected to exceed 130,000 m³ until 2020. The need for commercial reserves is estimated to range between 30,000 and 40,000 m³ under the most difficult conditions. Therefore, it is obvious that, generally speaking, storage capacities in this
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country can meet the need for oil reserves until 2020 provided that appropriate rehabilitation of oil reservoirs is performed and their original purpose changed.

The type and size of activities related to maintenance of emergency oil reserves in Montenegro largely relate to the following aspects which should be decided upon by the Government once the plan of activities for maintenance of obligatory oil reserves has been adopted:

- The rate of growth of the development of activities aimed at maintenance of obligatory oil reserves in terms of the number of days of consumption covered. As widely accepted, the objective is to achieve obligatory 90-days reserves to comply with obligations of EU or IEA members. This level, while necessary and feasible, cannot be achieved in a short period of time due to the necessary adjustment of oil market and incorporated costs which will be allocated directly or indirectly to end users thus increasing prices of various services.

- Improvement of activities undertaken based on the schedule that will take into account acquiring of experiences and knowledge of activities related to maintenance of oil reserves. It is logical that simpler and more efficient approaches will be implemented in the initial period until sophisticated techniques and methods can be adopted. It is very important to stress that activities related to maintenance of oil reserves require specialized skills that can be found only in experts in trading in oil and oil processing industry.

- Development of national and international scope of activities related to ensuring oil reserves if local capacities and trading activities provide for such development. It is justified and it happens in many EU countries with insufficient storage capacities that they primarily implement activities related to maintenance of obligatory oil reserves within their respective territories and then ask for oil storage services from other countries, especially when they cannot fulfil their obligations with existing capacities.

The combination of decisions on above issues and on other matters defining the scope of activities will be promoted in the context of activities of maintaining of obligatory reserves and the choice of appropriate organizational scheme will result in the development of the model for Montenegro for obligatory oil reserves.

The following schedule of future activities is designed in order to establish activities related to maintaining of emergency reserves:

1. Establishing of a central body for managing reserves (CSE) which will manage and control proper ensuring of oil reserves and take part the next steps of establishment of activities aimed at ensuring of oil reserves (estimated time - optimum 2-3 months).

2. Detailed design of the system for ensuring national oil reserves (estimated time 3-5 months).

3. Drafting a Regulation based on the system design which will include all relevant details in order to avoid disputes and illegal actions by participants on the market. (Estimated time 3 - 5 months).

4. Notification of the CSE about the date of coming into force and procedures that participants on the market should comply with in terms of their obligation related to
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ensuring emergency oil reserves (estimated time – 3 months following the promulgation of the above Regulation).

Finally, it should be pointed out that it is extremely important that participants on the market engage in all of these phases through consultations and dissemination of information so that they are ready themselves to comply with market requirements to be created once systems of oil reserves have been established. In addition, owners of oil storage capacities should be prepared to renew existing reserves.

7. PUTTING IN PLACE A LEGAL FRAMEWORK FOR THE FUTURE MARKET OF GAS

Montenegro still does not have a developed infrastructure for gas. The new Law on Energy, however, regulates the area of gas. In compliance with such legal directions, the Energy Regulatory Agency will, under its competences and in legally defined periods, make efforts to prepare timely the bylaws needed for functioning of this field of energy sector immediately after the necessary infrastructural conditions are put in place.

The Law prescribes that gas operators and public supplier of natural gas will be identified within three years following coming into force of this Law, or not later than 90 days following the date of construction permit for building of transmission gas pipeline. Methodologies for defining tariffs and prices for transmission, distribution and supply of gas will be established not later than six months after the operator of gas transmission and distribution system has been identified.