Energy sector in Montenegro

- Strategic branches – bearers of Montenegrin economic development:
  - tourism
  - energy
  - agriculture
  - wood-processing industry.

- Energy – crucial sector for national economy in macro-economic context:

- Main energy undertakings:
  - Electric Power Company of Montenegro, Holding company – Nikšić (EPCG – Nikšić)
  - Coal Mine, Holding company - Pljevlja
  - Brown Coal Mine "Ivangrad"- Berane
  - “Jugopetrol”, Holding company - Kotor
  - “Montenegro Bonus” - Cetinje
Characteristics of energy sector:

- extremely high import dependence (entire needs for liquid and gas fuels and about 1/3 of electric power)
- huge non-utilized, but energetically qualitative potential, particularly hydro-potential
- great possibilities for utilization of renewable energy resources
- predominance of electric power in energy balance
- energy inefficiency and high energy intensity
- high amortization of energy infrastructure and the need for its rehabilitation and technological modernization
- reform activities

Energy sector reform:

- Energy Law (passed in June 2003)
- Energy Regulatory Agency (established in January 2004)
- Energy Efficiency Strategy (adopted in October 2005)
- Small Hydro Power Plants (SHPPs) Development Strategy (adopted in April 2006)
- Energy Community Treaty (ratified in October 2006)
- Decree of concession for SHPPs (adopted in November 2006)
- Kyoto Protocol (ratified in March 2007)
- Study on Assessment of Renewables Potential – wind, solar energy and biomass (adopted in April 2007)
- Regulation for connect SHPPs on the electrical-distribution grid (adopted in May 2007)
- Instructions for determine price from SHPPs (adopted in July 2007)
- EPCG’s restructuring (functional and legal unbundling)
- Tender for research and built SHPPs on 43 location (in finalisation phase)
- Energy Development Strategy of the Republic of Montenegro until 2025 (in finalisation phase)
The aims of Energy Policy of the Republic of Montenegro

- Qualitative, reliable and diverse energy supply
- Maintenance and rehabilitation of the existing and construction of the new energy infrastructure
- Reduction of import energy dependence of the Republic of Montenegro
- Establishment of adequate legislative, institutional, financial and regulatory framework for private capital investments
- Creating conditions for higher utilisation of renewable energy resources, cogeneration and clean technology using fossil fuels
- Establishment of competitive energy market
- Provision of institutional and financial incentives in order to improve energy efficiency and reduce energy intensity in all sectors
- Sustainable production and consumption of energy in relation to environmental protection, and international cooperation, especially in the field of reduction of greenhouse gas emissions
- Support to scientific researches, development and introduction of new, clean and efficient technologies

Renewable energy resources in Montenegro

- Renewable energy resources could have an important role in energy balance of Montenegro

- Key renewable energy resources in Montenegro:
  - water flows hydropotential
  - wind
  - biomass
  - solar energy

- Necessary to research more intensively the possibilities how to use renewables and create conditions for their commercial utilisation
Hydro power potential (1)

- Hydro power potential of Montenegro:
  - ~10,000 GWh/year in main water flows
  - 800 ÷ 1,000 GWh/year in small water flows
  - utilised ~17% of total hydro power potential

- Existing small hydro power plants (sHPPs):
  - Share in total power of the power plants in the Republic of Montenegro is 1.1 %
  - Production share in total average annual production is 0.9%

- Realistically usable potential to construct sHPPs assessed as ~ 400 GWh/year
  - Potential sites for sHPPs construction are characterized by relatively small flows and high slopes

Hidro power potential (2)

- Hydro power potential of small flows assessed on 70 locations:
  - Total installed power: 231 MW
  - Annual electric power production: 644 GWh

- Explorations for sHPPs construction on 15 potential locations are in finalisation phase:

- Planned explorations for new 15 potential locations

- It is planned to construct several sHPPs until 2025:
  - Total installed power: 30 MW
  - Annual electric power production: 78 GWh
Projected sHPPs

- Potential sHPPs with greatest level of elaborated documents:
  - HPP »Buča« and »Vukovo Vrelo« (outline project - 1984)
  - HPP »Šavnik - 2« (concept - 1992)
  - HPP »Krupac« and »Slano« (general project - 2002)
  - HPP »Otilovići« (outline project and Tender documents - 2001)

Wind energy (1)

- Under Study on assessment of renewables potential (wind, solar energy and biomass) wind speed values in Montenegro are:
  - In major part of Montenegrin territory < 5 m/s
  - in central and coastal region 5÷7 m/s
  - in certain areas along sea coast 7÷8 m/s
  - Typical values of wind energy potential 100÷300 W/m²
  - In the most windy areas, wind energy potential > 400 W/m²
    (on the slopes and peaks of the mountatins)
  - Overall wind energy potential in Montenegro ~ 400 MW
    (most windy areas + zones with mid potential)
  - Wind energy potential in the most attractive regions in the Republic of Montenegro ~ 100 MW
Wind energy (2)

- **As per the Study** (taking into account technical, economic and ecologic limitations), the most attractive sites for utilisation of wind energy potential in Montenegro are:
  - **Coastal region** (having mid wind speed over 6 m/s), with the most interesting areas as follows:
    - mountain of Rumija
    - hills over Petrovac
    - mountain zones over Herceg Novi and Orahovac
  - **Hills around Nikšić** (mid wind speed in the range of 5.5 - 6.5 m/s)
- **Under Draft Energy Development Strategy of the Republic of Montenegro until 2025:**
  - 4 wind power farms are predicted to be constructed, total power **20 MW** (4 x 5 MW)
- **Necessary:** undertake detailed measurements, determine micro-locations for potential projects, develop feasibility studies for concrete projects, realize pilot projects

Solar energy

- **According to the Study,** Montenegro has one of the greatest potentials for solar energy in South East Europe
- **Assessment of solar energy potential is made only on the basis of satellite data**
- **Research results – number of sunshine hours:**
  - > 2000 hours/year for major part of Montenegrin territory
  - > 2500 hours/year along sea coast
- **Year quantity of solar energy in Podgorica of 1602 kWh/m²** (more than in Rome or Athens)
- **The Study recommends:** application of solar collectors for sanitary water heating and heating the rooms in households and touristic facilities
- **Necessary to undertake:** research market and all relevant sectors, evaluate potentials related to heating and cooling by application of solar systems in households, tourism, industry and public buildings
Biomass energy

- Under the Study, Montenegro has great biomass energy potential (forestry sector, wood-processing industry and agriculture)
- Potentially available wood quantity in forest fund of the Republic of Montenegro is assessed to 2.6 m³/ha/year
- Current rate of utilisation of wood from the forest fund amounts to approximately 1 m³/ha/year
- Assessment of wood scraps at national level:
  - quantity of wood scraps for energy needs >30000 m³/year
  - quantity of saw mill scraps >33000 m³/year
  - total 64000 m³/year
- Based on assessed biomass potential from forestry and wood industry, preliminary economic analysis is made for three biomass power plants of 2 MW, 5 MW and 10 MW
- Necessary: to gather additional data, develop feasibility studies and assess possibilities for realization of concrete projects, both from technical and economic aspect

Geothermal sources and solid waste

- Until now, in Montenegro:
  - no substantial geothermal water sources have been discovered
  - solid waste has not been used as an energetic fuel
- Strategic master plan for waste management predicts waste discharge onto several regional sanitary dumps
- The assessment says that 200.000-250.000 t/year of utility solid waste is formed in Montenegro
- Needs to examine in details the possibility to construct industrial plants to burn out the waste and produce heat and electric power (potential sites – in the vicinity of big cities)
- Energy Development Strategy of the Republic of Montenegro until 2025 predicts construction of one power plant on solid utility waste, 10 MW power
Future activities

- Under Energy Development Strategy of the Republic of Montenegro until 2025, the following activities are to be undertaken in the forthcoming period in Montenegro:
  - Intensive explorations on the sites predicted for construction of small hydro power plants
  - Design Study for wind power plants development
  - Work to eliminate barriers unabling fast and comprehensive utilisation of renewable energy resources
  - Intensive activities, in direction, for explore water from lake "Bileća" (25% is on territory of Montenegro, other on territory of Republika Srpska (Confederation Bosnia and Herzegovina)) by built HPPs "Boka" (derivative: cumulative hidropower plant on Adriatic sea, near town "Risan" in Boka Kotorska, with large power). By economic, energetic and ecology aspect, this is great solution. It will be needed agreement between these sides about distribution water from lake "Bileća".

- In accordance with the provisions of the Treaty establishing Energy Community of SEE, Montenegro will prepare Action Plan for implementation of the EU Directives on renewable energy resources