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Ministarstvo za ekonomski razvoj

ENERGY DEVELOPMENT STRATEGY OF MONTENEGRO BY 2025

WHITE PAPER

Podgorica, November 2007

INSTITUTE FOR RESEARCH IN ENERGY, ECOLOGY AND TECHNOLOGY

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Table I: Abbreviations and symbols

Symbol	Meaning
AD	*Akcionarsko društvo* (Shareholding Company)
AS	Analysis of sensitivity
GDP	Gross Domestic Product
GDP/cap	GDP per capita
BAT	Best Available Technology
BOT	Build-Operate-Transfer
CANU	*Crnogorska Akademija Nauka i Umjetnosti* (Montenegrin Academy of Science and Art)
CDM	Clean Development Mechanism
CG	*Crna Gora* (Montenegro)
CO_2	Carbon Dioxide
EC	European Commission
EE	Electrical Energy
EES	Electro-energetic System
EIHP	Energy Institute «Hrvoje Požar»
EPCG	*Elektroprivreda Crne Gore* (Electric Power Company of Montenegro)
ES	Energy System
ESCO	Energy Service Company
EU	European Union
EU-15	Fifteen states of European Union
EUR	Euro
EUR/cap	EUR per capita
HPP	Hydro Power Plant
IEA	International Energy Agency
IREET	Institute for Research in Energy, Ecology and Technology
SEE	South- East Europe
KAP	*Kombinat aluminijuma Podgorica* (Aluminum Plant in Podgroica)
MEDEE	*Modele d'Evolution de la Demande d'Energie* (Model of Energy Demand Development)
Monstat	*Statistički zavod Crne Gore* (Montenegrin Bureau of Statistics)
NO_x	Nitrogen Oxide
NRSE	„New" renewable sources of energy
OPM	Open pit mine
RSE	Renewable sources of energy
PHLG	Permanent High Level Group
RoM	Republic of Montenegro
SI	System of International units
SO_2	Sulphur Dioxide
LPG	Liquified Petroleum Gas
LNG	Liquified Natural Gas

Symbol	Meaning
TL	Transmission line
TS	Transformer station
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNMIK	United Nations Interim Administration Mission in Kosovo
USD	US Dollar
WASP	*Wien Automatic System Planning Package*
ŽN	*Željezara Nikšić* (Steel Plant Niksic)

Table II: System of International Units (SI)

Category	Unit	Sign	Dimension
Basic units			
Length	meter	M	m
Mass	kilogram	Kg	Kg
Time	second	S	S
Electric energy	Ampere	A	A
Derived and special units			
Area		m^2	m^2
Volume		m^3	m^3
Energy	joule	J	$Kg\ m^2\ s^{-2}$
Power	wat	W	$Kg\ m^2\ s^{-3}$
Voltage	volt	V	-

Table III: Prefixes in SI units

Factor	Prefix	Symbol
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k

Throughout the world different energy mesurement units are used in practice, such as: joules (J), *British Thermal Unit* (Btu), calories (cal), kilowathour (kWh), etc. (Table IV), while the Strategy uses primarily J as prescribed SI unit for energy and sometimes Wh as the most commonly used electrical energy measurement unit (both with appropriate prefixes). In order to provide possibility of comparison with Eurostat statistics, ton of oil equivalent ("toe") is used occasionally. While J, kWh and cal are precisely defined units for toe, for ton of coal equivalent (tce) and Btu international conventions and agreement apply, under which:

1 toe (ton of oil equivalent) = 10 Gcal

1 tce (ton of coal equivalent) = 7 Gcal

1 Btu = 1.055,06 J

Table IV: Transformation factors between energy units

Multiply with:	**To the unit**	TJ	Gcal	Mtoe	MBtu	GWh
From the unit						
Terajoule (TJ)		1	238,8	$2,388\ 1 \times 10^{-5}$	947,8	0,2778
Gigacalories (Gcal)		$4,1868 \times 10^{-3}$	1	10^{-7}	3,968	$1,163 \times 10^{-3}$
Million tons of oil eqivalent (Mtoe)		$4,1868 \times 10^{4}$	10^{7}	1	$3,968 \times 10^{7}$	11.630
Million Btu (MBtu)		$1,055\ 1 \times 10^{-3}$	0,252	$2,52 \times 10^{-8}$	1	$2,931 \times 10^{-4}$
Gigawathour (GWh)		3,6	860	$8,6 \times 10^{-5}$	3.412	1

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STATEMENT OF THE MINISTER (1 page)

ACKNOWLEDGEMENTS

Hereby we would like to thank numerous institutions and individuals who, whether directly or indirectly, contributed to the realization of this significant project.

We hope that the Energy Development Strategy of Montenegro by 2025, besides its basic purpose of being a platform in the process of Montenegro's energy sector approaching to the EU, will be able to serve many users (professional agencies and government institutions, representatives of international organizations, potential investors, donors, energy companies, etc.) as a rich source of relevant and useful information about Montenegrin energy.

1. PRELIMINARY NOTES

The development of Montenegro's energy policy is both a short- and a long-term challenge. Thus it requires a clear, yet adjustable framework: clear in a sense to represent a determined approach supported at the highest level, and adjustable meaning a need to be regularly supplemented.

"The Energy Development Strategy of Montenegro by 2025" (hereinafter "the Strategy")

is a document that sets out specific objectives and defines mechanisms for shifting from classical understanding of supplying consumers with *energy* to a safe, competitive and environmentally acceptable supply of *energy services*. The Strategy sets out the perseverance and mechanisms for the alteration to the understanding of the role and the importance of energy in production and infrastructure development, defines the guidelines of the Montenegrin energy sector development, thus attracting foreign investors interested in this sector, and in the long term, aiming at increasing employment, reducing poverty, and raising the level of overall social welfare.

The Strategy represents the Montenegrin vision of energy management in its wider sense, prepared in accordance with certified Terms of Reference of the Ministry of Economy of the Republic of Montenegro Gore (July 2005) and based on the results of a comprehensive scientific research previously defined by the expert team in the first part of the entire project "Professional basis for the Energy Development Strategy of the Republic of Montenegro".

The authors of the Strategy applied the following methodologies: MEDEE, WASP, sector-specific methodologies (e.g. for grid planning, and the like) as well as a special methodology (EIHP) for preparation of energy balance after the professional assessment of the authors that the level of EUROSTAT and IEA methodologies would not be sufficient for the Strategy development purposes, since the economy sectors of vital importance for Montenegro require a wider analysis in order to make better quality forecasts on future energy needs.

The strategy is a document resulting from a close cooperation of the authors with numerous domestic and international experts in the field. Workshops and many consultations provided useful advices, suggestions and positive critiques, which contributed to quality improvement of the Strategy. The dynamics of its preparation pointed to numerous differences in viewpoints, neglected fields and approach differences, and professionally, it revealed the boundaries and limits of our present knowledge. The Strategy preparation was coordinated by the Ministry of Economy/Ministry for Economic Development of Montenegro. The preparation of Professional basis and the final document of the Strategy is the result of cooperation between experts from the IREET Institute for Research in Energy, Ecology and Technology (Ljubljana, Slovenia), the Energy Institute Hrvoje Požar (Zagreb, Croatia), the representatives of the Montenegrin Academy of Science and Art (CANU), the University of Montenegro, Electric Power Company of Montenegro (EPCG), the representatives of the Coalmine Pljevlja, Jugopetrol, Montenegro Bonus, Institute for Strategic Studies and Prognosis (ISSP) and representatives of various other institutions and the Government of the Republic of Montenegro.

The Strategy incorporates the energy, ecological, economic, legislative, organizational, institutional, and educational dimension. It covers the period up to the year 2025 that will experience the succession of existing and future technologies, and changes in diversification and the manner of resources and energy management; it envisages legislative, economic, organizational, institutional, information, educational, counseling, and promotional measures for its implementation.

The unemployment rate in Montenegro is higher than the global average and that in the EU. Therefore, the imperative of the Strategy, as a prerequisite and a support to other development segments of the society, is to give its contribution to domestic employment through a wise opting for indigenous production and energy services and by introducing such technologies that will not devastate the environment, bearing in mind the international reputation and status of Montenegro as an ecological state.

The Strategy is certainly a part of the overall strategy for planned economic development of Montenegro and it gives a clear vision of Montenegrin future energy system that prioritizes the interests of the state of Montenegro and its citizens; it takes cognizance of all EU documents; it implies a significant reform of the energy sector and the continuation of transition with the ultimate objective being the creation of new energy sources in line with European standards. That is why the envisaged measures for the implementation of the Strategy are in manifold dimensions, and their implementation is of great importance both regarding dynamics and priorities.

Therefore, for the purpose of a comprehensive documentation background and better insight in the present condition of available resources, and as a part of the overall project and set out terms of reference, the following studies have been prepared:

- **Book A:** HISTORIC ENERGY BALANCES (July 2006)
- **Book B:** FORECASTS OF FINAL ENERGY DEMAND (July 2006)
- **Book C:** DEVELOPMENT OF COAL, OIL, AND GAS SYSTEMS IN MONTENEGRO
- **Book D:** DEVELOPMENT PLAN FOR ELECTRIC POWER SYSTEM OF MONTENEGRO (Master plan) (July 2006)
- **Book E:** LONG-TERM PLAN OF ENERGY SUPPLY TO MONTENEGRO – ENERGY BALANCES UP TO 2025 (July 2006)
- **Summary of Books A, B, C, D, and E** (August 2006)

A logical continuation of the aforesaid documents was presented in June 2007, in the final document "The Energy Development Strategy of Montenegro by 2025" ("the Green Book") which takes the central place in the overall project as it opens a new road to the development of Montenegrin energy by respecting its multifunctional role in overall development of the country.

The basic documents of the Strategy (Books A-E) have been conceived and prepared so that each of them represents a whole and can be used separately; at the same time, they are integral parts of the unique document, the Strategy. Bearing in mind their dual nature, the authors tried to avoid certain repetitions as much as possible. Where necessary, some of the basic starting points of the future energy sector reforms have been reiterated.

The first chapter of the Green Book describes energy as an incentive of global growth. Within this framework, it presents international trends in energy management and the movement of primary energy sources in the world market in the previous period, as well as the European energy dimension in the conditions of global interdependency by pointing to the main indicators of the current situation in the EU energy sector.

The third chapter is dedicated to the analysis of the existing, and proposals for the enactment of new, laws with regard to the RoM energy sector, and the summary of regulations prescribing the organization of economic subjects, property law, water management and forestry, investments, building, and environment protection.

The fourth chapter gives a detailed overview on European dimension of Montenegro's energy by taking into account the common European energy policy and its main development directions, and the effects of its energy market development on the Montenegrin energy sector development.

The fifth chapter deals with the long-term energy balances of Montenegro up to the year 2025, the assumptions and starting points for forecasting energy supply wherein, based on the two possible scenarios of GDP growth and the research of Montenegro's economic growth, the authors give two scenarios of the electro-energy system (EES) development and growth (N-1 and N-2), the structure of energy sources and system of meeting future energy demand according to scenarios. Based on the scenario of growth in final energy consumption and energy transformation sector and the scenario of the electro-energy system development, the authors give three possible scenarios of the building and development of the entire energy system of Montenegro (S1, S2 and S3) with energy balances projections.

The sixth chapter presents the strategy for efficient use and supply of energy in Montenegro, defining the strategy for efficient use of energy, the strategy for electricity supply, the strategy for production sector development as by scenarios, the strategy for distribution and transmission network development, and the strategy for development and supply of Montenegro with all types of energy sources.

The seventh chapter gives the technological development and technical possibilities in Montenegro's energy system and the required measures for energy supply are presented in the eighth chapter of the Strategy. The strategic importance of education and international cooperation are underlined in the ninth, while the tenth chapter gives an overview of the required funds for the implementation of the Energy Development Strategy of Montenegro by 2025, along with the necessary fiscal and tax instruments.

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The detailed effect of the strategy for the development of energy production and supply in Montenegro is viewed from the aspect of legal obligations with regard to environment protection and impacts and described in the eleventh chapter wherein, depending on a scenario, potential locations of new production sites were also presented.

Objectives and mechanisms for the implementation of the Strategy on the basis of the current situation in Montenegro the authors give in the twelfth chapter, and the method of monitoring the implementation with regard to international framework and requirements is recommended in the thirteenth chapter.

The Strategy presentation, promotion, informing the public and the relevant public relations are described in the fourteenth chapter.

The Strategy ends with the authors` concluding remarks, summary of major reccommendation sand bibliography data.

Abstract from the Energy Development Strategy (»**Green Paper**«) completed in June 2007, represents a summary of results of all concluded integral research and expert analysis.

On June 21 of the current year, the Government of the Republic of Montenegro has adopted the Draft Energy Developemnt Strategy by 2025 and has enacted a decision on submitting this document for public debate. Public debate commenced on June 21 and lasted until June 23. Public debate was extened until September 1, 2007 following the Government of Montenegro decision. All interested parties were able to e-mail their proposals, suggestions and comments to the Ministry of Economic Development. Besides general public, participants of the public debate were representatives of the ministries, NGOs (MANS, Green Home, Montenegro Business Alliance, etc.), Chamber of Commerce, energy companies (EPCG, Coal Mine AD Pljevlja, etc.), international organizations (EAR, EBRD, KfW, UNDP, WB) present in Montenegro.

Public debate was organized through several communication forms:

- Through 2 »web-sites«: www.minekon.vlada.cg.yu and www.sre.vlada.cg.yu, in both Montenegrin and English language. These web addresses contain Professional basis (Books A-E),
- Through »web-forums« created for the Draft Strategy located on the address: www.sre.vlada.cg.yu/forums,
- Invitation to participate in public debates along with the Draft Strategy was sent to over 2.000 e-mail addresses, such as: ministries (domestic and regional), NGOs, political parties, embassies, diaspora and international organizations with representative offices in Montenegro,
- Advertising in daily newspaper with invitation for participation in the public debate,
- Organizing press conferencies for regular information of public on activities during public debates. Public debates in form of open discusisons were organized in Nikšić, Kolašin, Pljevlja and two in Podgorica, which were attended by over 400 interesetd parties (organizations and individuals),
- Organizing study visits of locations planned for construction of key sites of the Strategy (HPP Perućica, HPP na Morači, TPP Pljevlja and Coal Mine AD Pljevlja),
- Study visit of Montenegrin delagation to Austria related to renewable energy sources, in particular small hydro powe plants, windmills and biomass power stations.

Proposals, suggestions, opinions and comments (343) on the Draft Strategy presented on public debates have been systematized and considered by persons that have prepared ands finalized the White Paper.

The "WHITE PAPER", as a final document in the process of adopting the Energy Development Strategy of Montenegro by 2025, includes all relevant and professionally acceptable remarks.

2. INTRODUCTION

A resolute commitment of Montenegro, as an independent and internationally recognized country, to continue with the initiated process of Euro-Atlantic integrations requires a responsible and complex development approach, particularly a planned development of the energy sector as the mainstay of the overall development of the country. The energy sector development is of great, and maybe the crucial, importance for the overall development of the Republic of Montenegro (RoM) as from ecological and social, so as from macroeconomic point of view.

At the time when Montenegro's energy development faces new challenges, the following document emerges:

"The Energy Development Strategy of Montenegro by 2025"

as the starting point for a European model of a sustainable and strategic development of its energy sector and the enactment of other necessary legislation, and the institutional support for a successful implementation of Montenegro's energy policy on its way to European and broader international integrations, and certainly as a support to the Government of the Republic of Montenegro and other government institutions in the preparation of other energy program documents.

The Strategy, as one of the highest legal acts, also has the key development dimension within Montenegro, as in defining its spatial development, providing conditions for a sustainable development of the ecological state, in gaining the broadest consensus for its adoption and implementation, so as in energy end economy domains as important components of GDP growth, and the process of inevitable constructive communication among all the interested segments of the Montenegrin society.

The Strategy implementation is expected to increase investors` interest and volume of foreign direct investments in the Montenegrin energy sector.

Montenegro's Strategic Energy Development

Energy policy of the RoM was adopted in April 2005. In the period 2005 – 2006, the professional basis for the Strategy was finalized (Books A-E), and in June 2007 the document "Energy Development Strategy of Montenegro by 2025"- Green Book/Paper was prepared. The next step following the adoption of the White Paper is the preparation of the Action Plan for the Strategy implementation for the first 5 years (2008-2012)

Strategy Timetable

The Strategy covers a long-term period, up to 2025, which can be considered sufficient for the achievement of structural changes in the energy infrastructure development, yet having a significant positive effect on quality of supplying consumers with energy and on the overall macroeconomic development of Montenegro.

Energy Policy Objectives

Main objectives of adopted Energy policy, supported in the Strategy have been presented in the Framework 1.

FRAMEWORK 1: ENEGRY POLICY OBJECTIVES OF THE REPUBLIC OF MONTENEGRO

1. Secure, high quality, reliable, and diversified power supply aimed to comply the supply with the demands in all forms of energy,
2. Maintenance, rehabilitation and modernization of the existing infrastructure and the construction of reliable new infrastructure required for generation and utilization of energy,
3. Reduction of energy import dependence, primarily through creation of stable conditions for investments in research /exploration and construction of new power facilities (especially on the basis of already explored resources related to unused hydro-potentials), as well as investments in other energy infrastructure,
4. Design of relevant legislative, institutional, financial and regulatory framework to encourage private sector involvement and investments in all aspects of energy infrastructure,
5. Creation of conditions for higher utilization of renewable energy resources, combined power and heat generation (CHP) and for the usage of fossil fuels based on clean technologies,
6. Establishment of competitive market in order to provide energy in the fields where there is a possibility to do so (generation and supply) in accordance with the concept of regional energy market, with regulated monopoly network activities,
7. Provision of institutional and financial incentives with the purpose to improve energy efficiency and reduce energy intensity in all sectors, from generation to consumption of energy,
8. Sustainable production and utilization of energy in relation with environmental protection, and international cooperation in this field, especially with respect to reduction of GHG emission,
9. Supporting research, development and promotion of new, clean and efficient energy technologies, as well as implementation of energy policy based on expert and scientific grounds.

3. MAIN STRATEGIC COMMITMENTS

1. **The Strategy is based on adopted Energy Policy of RoM (2005), its current international obligations, and the EU Energy Policy Guidelines,**
2. **Montenegro accepts obligations set out in the Energy Community Treaty as the key document for implementation of energy reforms - prescribing directions, rules, and measures for the (re)organization of the electro-energy sector, oil sector and the gas sector in future, as well as the regional market development of these energy sources,**
3. **Montenegro will strive to fulfill all the required measures for a successful implementation of the Acquis Communautaire regarding energy, environment, competition, and renewable energy sources in line with requests and dynamics set out in the Energy Community Treaty,**
4. **Identify energy as the mainstay of the overall, sustainable, and long-term stable growth of Montenegro with positive macroeconomic effects,**
5. **Improvement of energy efficiency in production and consumption to the level of moderately developed EU countries,**
6. **Safe, secure, reliable and quality supply of consumers with energy at realistic prices,**
7. **Undertake concrete measures to achieve 20% share of renewables energy sources in total consumption of primary energy in Montenegro,**
8. **Rational and wise use of hydro-energy potentials at the river basins of Morača, Komarnica, Lim, Piva, Tara, Zeta, Ibar and Čehotina with full adherence to the applicable UNESCO declarations, decisions of the Montenegrin Parliament, and principles of sustainable development,**
9. **Rely on the exploitation of domestic coal reserves as the second important energy resource of Montenegro besides hydro-energy; the construction of thermal power plant Pljevlja 2 and the heating system in town Pljevlja. Additionally, there is a possibility to construct TP Berane if the investments is proven to be economically profitable;**
10. **Revitalization and technical modernization of the existing electricity production, transmission, and distribution system,**
11. **Improve business efficiency and reduce the impact of coal exploitation and thermal power plants on environment,**
12. **Reduce energy dependency (reduction of energy imports) and improve the safety of energy supply in Montenegro,**
13. **Support development and accelerate the introduction of renewable energy sources, using solar energy for obtaining thermal energy, replace industrial and small boiler rooms with cogenerations using liquefied petroleum gas (LPG), introduce other local energy systems in the country's energy system,**

14. Develop the system of liquefied petroleum gas (LPG) as a strategic precedent to natural gas,

15. Develop the system of natural gas (including construction of regional gas lines, terminals for reception of liquefied natural gas and plants for use of natural gas),

16. Implement strategic 90-days reserves of oil derivatives in compliance with EU Directive,

17. Implement a program of regulatory, legislative, and operational inclusion in the process of EU accession with regard to energy and ecology including integration in the energy market of SEE and EU,

18. Continue with oil and gas exploration at the Montenegrin coast, coal exploration in Pljevlja and Berane basins, and carry on the study work on the exploitation of the remaining hydro potential,

19. Improve the regulatory process and professional independence of the regulatory agency in line with energy policy of the Government of Montenegro,

20. Reach agreements with neighboring countries (Bosnia and Herzegovina, Croatia, Serbia, and Albania) on the optimal utilization of the joint hydro potential and the general water use and management, and plan new electrical energy interconnection lines for connection with these countries,

21. Active inclusion of Montenegrin institutions in international cooperation in energy research and development, and the introduction of energy in the educational program at all educational levels,

22. Continue with energy sector reforms, in line with adopted Montenegro's Energy Policy and energy sector development concepts of the European Union, with a view to creating conditions for a safe, secure, reliable, and quality supply of consumers with energy at competitive prices, simultaneously respecting the principle of sustainable development and market operations,

23. Continue with the restructuring of the Montenegrin Electric Power Company AD Niksic, pass a Development Strategy and a Strategy of privatization of this company

24. With a view to creating conditions for following an active energy policy, establish the system for tracking data on energy output, consumption, and losses in accordance with the EUROSTAT system of national energy accounts,

25. Based on the ratification of the Kyoto Protocol in March 2007, as a country outside the annex for developed countries at least by 2012, provide opportunities and support to foreign investors for the implementation of the so-called Clear Development Mechanism projects (CDM),

26. Provide sociual protection in the process of energy sector changes that could affect social position of specific segments of the sociaty.

4. STRATEGY DEVELOPMENT BACKGROUND

4.1. INSTITUTIONAL ENVIRONMENT

The role of the Montenegrin Government in the energy field is to define and implement: the National Energy Policy and the Energy Development Strategy, long-term and annual energy balances and policy for their implementation, and provide for the implementation of environment protection measures.

Another role of the Government is to promote: investments, competition based on transparency and non-discrimination, connect Montenegro's energy system with systems of other countries (taking into account economic trends and energy needs) and the participation of the private sector in the energy sector. The Government also defines policies and strategies of building new, and reconstructing the existing capacities, and passes the relevant procedures.

Via the Ministry authorized for energy operations, the Government: implements the policy for energy efficiency and the preservation of energy resources, supports and advises on energy efficiency and rational energy utilization, develops and promotes efficient use of energy and renewable energy sources at the domestic market, manages funds designated for energy saving and efficiency, implements new energy technologies, promotes the participation of the private sector in Montenegro's energy sector, and carries out the privatization of state-owned energy subjects or their parts.

There is a number of active organizations in Montenegro whose activity supports the energy sector operations, starting from the Univesity of Montenegro, Montenegrin Chamber of Commerce, the Montenegrin Engineer Chamber, the Association of Economists of Montenegro, and numerous professional institutions, such as the Academy of Science, the Quality Association, the Standardization Bureau, the Institute for Technology Development, as well as many organizations, which are a sort of incubator for ideas and technical support for energy development strategies.

4.2. REGULATORY ENVIRONMENT

The Montenegrin legislation, which is in line with EU regulations, implies the respecting of dynamics and deadlines for the implementation of EU directives contained in the Energy Community Treaty (2005). The Treaty came into force on 1 July 2006 and was ratified in the Montenegrin Parliament on 26 October 2006, with which Montenegro accepted short-, medium-, and long-term tasks and deadlines prescribed in the Treaty. The key tasks are: (i) the implementation of Acquis Communautaire for energy, environment, competition, renewable energy sources, (ii) the passing of development plans for the implementation of "generally applicable European Community standards" in electricity and gas sectors, and (iii) the adoption of the "security of supply" statement that defines diversity of supply, technological safety, geographic origin of imported fuels, and other elements.

With a view to protecting consumers, providing financial sustainability of energy producing companies, promoting competition, collecting and extending information, the Strategy supports a continuous improvement of the regulatory process and professionalism of the regulatory agency.

The regulator should be given the authority to establish fixed regulatory practices (tariffs, licenses, and monitoring) and a clear responsibility in order to ensure transparency and credibility of the energy sector.

Regulatory activities in the energy sector in Montenegro are performed by the Energy Regulatory Agency. Agency was established in January 2004 in compliance with the Energy Law, which means that it was established by the Parliament of the Republic of Montenegro. The Parliament is electing members of the Agency Board, adopting the annual work report and approving annual financial plan of the Agency, i.e. its budget, which is completely separated from the government budget. Such legislative solutions enable maximum possible degree of independence of the Agency.

4.3. DOMESTIC LEGISLATION AND REGULATION

The creation of a investment-friendly environment with regard to the energy legal framework is based on regulations prescribing: energy, organization of companies and the tax system, property law, water management and forestry, investments, spatial planning, environment protection, and construction in a broader sense.

The legal infrastructure represents a good basis for the implementation of investments in this sector. However, the removal of normative barriers and improvements of regulations via their harmonization with EU regulations are under way, so the following laws are waiting for the enactment or being drafted: the Law on Waters; the Concession Law (replacing the Law on the Participation of the Private Sector in Public Services Provision); the Law on Construction of Buildings; the Law on Water Financing; the Law on Ecology Fund; the Law on Environment Protection (as amended); the Spatial Plan of the Republic of Montenegro by 2020, and other regulations.

The Montenegrin legal system as the Strategy basis: the Strategy has recognized and acknowledged the following applicable laws and regulations, as well as other documents in preparation, and pointed to the need of preparing new and amending the existing regulations of importance for Montenegrin energy:

a. Regulation related to energy: the Energy Law. The Energy Law serves as a basis for the enactment of numerous relevant regulations that are under way or have already been enacted.
b. Regulations related to the organization of companies and the tax system: the Company Law, Law on Value Added Tax, the Law on Property Tax, the Law on Immowable Property Tax.
c. Regulation related to property law: the Property Law, the Law on Expropriation.
d. Regulation related to water management and forestry: the Law on Waters, the law on Forests.
e. Regulations related to investments: the law on Foreign Investments, the Law on Participation of Private Sector in Public Services Provision.
f. Regulations related to spatial planning: the Law on Spatial Planning and Land Development.
g. Regulation related to environmental protection:
    - Law on Environment Protection,
    - Law on Nature Preservation,
    - Law on Strategic Environmental Assessment Impact,
    - Law on Envronmental Assesment Impact,[1]
    - Law on Integrated Prevention and Control of Environment Pollution,
    - Law on Waste Management, Law on Ionic Radiation Protection,
    - Law on National Parks,
    - Numerous regulations and rules of procedure prescribing environment protection in details.
h. Regulations related to building: the Law on Construction of Buildings.
i. Other: Drafting of the new Law on Nature Preservation and Strategy of Biodiversity is underway. There is a need to create and adopt legislative proposals and bylaws, as well as documents in the area of energy efficiency, use of renewable energy sources, technical standards and other documents pertinent to the European Union judiciary, and a continuous need to maintain the level of applicability and adequacy of the existing legal solutions.

Since the Spatial Plan of the Republic of Montenegro by 2020 and the Energy Development Strategy of Montenegro by 2025 are being enacted almost simultaneously, these documents have to be harmonized.

[1] New Montenegrin regulations will be implemented from january 1, 2008 – Law on Environmental Impact Assesment ("Official Gazette of RoM" no.80/05) and the Decree on projects fro which assesments on environmental impacts are prepared ("Official Gazette of RoM" no. 20/07).

4.4. RELEVANT INTERNATIONAL REGULATIONS

Harmonization of regulations related to development of energy sector of Montenegro has been relized to a large extent during the process of defining of this Strategy, therefore it can be confirmed that the Strategy is based on the EU regulations and continuity of harmonization of Montenegro's regulations with the EU.

One of the general provisions of the Energy Law prescribing "unbiased, transparent, and non- discriminatory energy sector regulation in line with the applicable international standards, including the European Energy Charter Treaty and EU energy regulations", brings to light Montenegro's commitment to harmonize its energy policy and energy sector regulations with European best practices and policy.

Energy Community Treaty requires implementation of *acquis communautaire*, i.e. EU legislation respecting established deadlines, namely:

- Directive on general rules of internal electricity market (2003/54/EC), Directive on general rules of internal natural gas market (2003/55/EC), Regulation on the access to transport network for cross-border exchanges in electricity (1228/2003/EC) within 12 months following to this Treaty coming into force, i.e. July 1, 2007;
- Decree on deadlines for qualified consumers, where from January 1, 2008, qualified buyers should be able to choose the supplyer, as well as all buyers starting from January 1, 2015;
- Directive on the assesment of effects of certain public and private projects on the environment (85/337/EC, and ammending Directive 97/11/EC and Directive 2003/35/EC) – as of July 1 2006; Directive on reduction in the sulphur content of certain liquid fuels (1999/32/EC, and ammending Directive 93/12/EC) – up to December 31, 2011; Directive on limitations of emissions of certain pollutants into the air from large combustion plants (2001/80/EC) – up to December 31, 2017, and provisions from the Article 4(2) of the Directive on the conservation of wild birds (79/409/EC) - as of 1 July 2006.

In addition, in accordance with Energy Community Treaty, Montenegro has the obligation to prepare for the European Commission, by July 1, 2007, the action plan for the implementation of Directive 2001/77/EC on promotion of electricity produced from renewable energy sources and Directive 2003/30/EC on promotion of biofuels or other "renewable" fuels for use for transport. Montenegro has fulfilled its agreed obligations within established plan and within the agreed deadline.

With the implementation of projects and programs defined in this Strategy, Montenegro shall completely adhere to and affirm international agreements and assumed responsibilities, thus harmonizing its development with international regulations.

RoM ratified the Kyoto Protocol for the United Nations Framework Convention on Climate Change (UNFCCC) on 27 March 2007 (the Law on Ratification, Official Gazette of the Republic of Montenegro, no. 17/2007). Montenegro is not on the list of developed and/or transition countries towards market economy (Annex 1), thus not having direct obligations to reduce greenhouse gas emission at least by 2012. By signing the Protocol Montenegro also fulfilled one of the conditions for joining the European Union.

In June 2007, the Council of Ministers of the Energy Community has adopted conclusions of the Permanent High Level Group (PHLG), which included the statement on measures for attaining supply security. In that regard, Montenegro is obligated to implement and include in the domestic regulations the following directives: Directive 2005/89/EC on measures for electricity supply security and infrastructure investments, Directive 2004/67/EC on measures for attaining natural gas supply security and Regulation 1775/2005/EC on conditions for accessibility of natural gas to transmission network.

4.5. EUROPEAN DIMENSION OF MONTENEGRIN ENERGY SECTOR

Montenegro will continue with an active policy of European integration with the ultimate objective being a full membership of the EU. Therefore, it is necessary for its Energy Policy and Strategy to be in line with the EU energy policy. The proposed Energy Strategy reflects all the required elements of such an approach and a geo-political development of Montenegro.

WHITE PAPER

Montenegro has accessed: (i) the Geneva Convention on Long-Range Transboundary Air Pollution (1979), (ii) the Energy Community Treaty (2005), and (iii) the Kyoto Protocol (2007).

Montenegro accepts EU energy policy based on five groups of European energy regulations with regard to defining future development: (i) security of energy supply, (ii) single electricity and natural gas market, (iii) efficient energy consumption and production, (iv) utilization of renewable energy sources, and (v) nuclear energy.

RoM agrees with a proposal of the European Commission (January 2007), to fulfill the following goals in the member countries of EU until 2020:

- reduce the emission of greenhouse gases by 20%,
- drastically increase energy efficiency and reduce energy consumption by at least 20%,
- increase the share of renewable energy sources to 20% of total primary energy consumption,
- increase the share of biodiesel fuel to at least 10%.

5. ENERGY SECTOR OF MONTENEGRO IN THE PERIOD 1990-2006

5.1. ENERGY SECTOR CHARACTERISTICS

According to the Bureau of Statistics of Montenegro (Monstat), data on the energy sector of Montenegro are limited. Monstat disposes of specific data related to electrical energy sector and coal sector, while currently, they have no data on liquified fuel sector (oil and oil derivatives, liquefied oil gas).

According to the Statistical Year Book of the Republic of Montenegro 2006, total number of employees in 2005 in the electrical energy sector of RoM was 3.645, with the average gross salary of 612,5 EUR, while in the coal sector total number of employees was 1.964, with the average gross salary of 449,9 EUR.

According to available data, share of electricity production in total industry production of RoM in 2005 amounted 23.3%, while in the GDP it amounted 4,6%.

5.2. ENERGY SECTOR POSITION IN THE ECONOMY

According to macroeconomic indicators, the main characteristics of the Montenegrin macroeconomic system reflect a stable economic growth.

Macroeconomic trends in Montenegro in 2006 and in the first half of 2007 compared to the previous period are marked by: (i) accelerated economic growth, from 4.0% in 2005 to 8.1% in 2006 and 6.9% in the first half of 2007; (ii) inflation that was at a low 2% level in 2006 has increased in the first half of 2007, (iii) fast and permanent reduction of unemployment rate, from 19.7% in 2005 to 14.7% in 2006 and 12.2% in 2007, (iv) maintenance of public sector surplus at around 3% of the GDP, (v) large increase of export (by 36.9% in 2006), however followed by even learger increase of import (by 54.7% in 2006), (vi) trends in international trade of goods and services lead towards fast increase of deficit of exchange of goods, which reached extraordinary large proportions of 31.6% in 2006, with further growing trend in 2007. Surplus in the revenue balance and current transfers is only slightly mitigating this deficit; (vii) exceptionally high increase of gross capital formation, raising from 17.93% GDP in 2005 to 30.48% in 2006, with further growing trend in the first half of 2007; (viii) deficit of the current account is mostly covered with net inflow of foreign direct investments, and also with the increase of other foreign investments; (ix) work productivity has increased by 3.7% in 2006.[2]

a. Model applied in the Strategy used 2003 as a base year. However, based on trends and macroeconomic indicators, it can be observed that trends remained the same and that possible data discrepancies do not affect recommendations provided in the Strategy.

b. Montenegro's GDP in 2003, as at the official exchange rate, amounted to 2,477 US$ 2000 per capita, which is 8.7 times less than the EU 15 average, but higher than GDPs of most countries in the region. In the same year, final energy consumption amounted to 1,159 kilogram equivalents of oil per capita, which is 2.5 times less than the EU 15 average, but similar to that in other countries of the region. Gross electricity consumption amounted to 7,290 kWh per capita, which is almost equal to EU 15 consumption, and two times more than in countries of the region.

In the GDP structure by certain economy sectors closely connected with the energy sector, the sector of electricity, gas and water production and supply showed an increase in the period 2000 – 2003 from 5.7% to 6.3%, while a share of the mining and quarrying sector fell from 2.7% to 2%. Manufacturing industry accounted for 9.6% and 12% in the same period. Production of KAP, together with Bauxite mines accounted over 21% of total Montenegrin GDP.

Of the total number of employed people in Montenegro (141 thousand in 2000 and 144 thousand in 2005), 3.8% - 3.9% were employed in the sector of electricity, gas and water production and supply (some 5,400 – 5,500 people), while most of the employed were in manufacturing industry, nearly 18%. The mining and quarrying sector accounted for the additional 3% of employees in the same period (Coalmine AD Pljevlja: 1,570 employees in 2006).

[2] Source: Ministry of Finance, Economic and Fiscal Program for Montenegro 2007 – 2010

5.3. PRIMARY ENERGY PRODUCTION

Of primary energy sources in Montenegro, brown coal, lignite, and firewood are produced, hydro-energy and industrial wood wastes are used, but there is no oil and natural gas production. In the period 1997 – 2006, the most important primary forms of energy were hydro-energy, depending on weather conditions, and lignite, then firewood and industrial wood wastes. In the same period, domestic production gradually increased: hydro-energy – 5.5%, lignite – 3.3%, and firewood – 4.6%, while domestic primary energy production in 2006 accounted for 54% of total primary energy consumption ("energy independence"). According to Eurostat methodology, total production of primary energy amounted to 24.59 PJ(100%), of which hydro-energy 8.26 PJ (33.6%), lignite 13.88 PJ (56.5%) and firewood 2.45 PJ (10.0%).

5.4. ENERGY IMPORTS AND EXPORTS

Energy imports: This implies energy imports from abroad and energy procurement outside Montenegro's borders, within the former State Union of Serbia and Montenegro. Montenegro imports oil derivatives, more than a third of the required electricity needs, and a very small amount of lignite.

A share of oil derivatives ranges between 55% and 60%, while that of electricity between 35% and 40%. The imported lignite contribution is below 1%. In the period from 1997-2006 oil derivatives imports increased 4.2% per year, while in the last year it has increased by 3.6% compared to 2005.

Import of electricity has been on the constant increase and in 2006 it has increased by 7,5% compared to 2005. Import of electricity in 2006 was 6,14 PJ (1.706 GWh), while import of oil derivatives amounted 14,77 PJ.

Oil derivatives imports include heating oil (crude oil), diesel oil, and gasoline. In the last few years, the share of crude oil ranged between 30% and 32%, that of diesel oil between 23% and 26%, while that of gasoline was somewhat lower (some 18%).

Energy exports: Realized exports of 0.73 PJ in 2006 means that it is insignificant compared to the energy imports. Exports included minimum quantities of coal (0,47 PJ) and electricity (0,26 PJ).

Import-export balance of total energy quantity in 2006 has increased by 4.8% (to 20,28 PJ) compared to 2005.

5.5. PRIMARY AND FINAL ENERGY CONSUMPTION

Total primary energy consumption in 2006 amounted to 46,11 PJ (1,101 thousands ton[3]) (100%). The main share in the consumption structure is oil derivatives – 32,3%, followed by coal – 30,1% and hydro energy – 19,6%.

c. **Final energy consumption** in 2006 amounted 34,4 PJ. The main share was of oil derivatives - 43%, electricity - 40% and heating energy - 9%. The remaining (2%) was coal and firewood. Oil derivatives consumption was on an increase of 6.3% due to a substantial consumption increase of diesel oil and gasoline. Share of firewood oscilated over the years, while the annual increase of this energy source amounted to 4.2%. The role of brown coal is totally negligible, while lignite consumption is on a downtrend.

5.6. TOTAL ENERGY BALANCE

The contributors in total energy balances of Montenegro are hydro-energy, oil derivatives, coal, wood and wood wastes, and the imported electricity. A solid diversity of supply has been achieved since the three main forms of energy account for in equal shares.

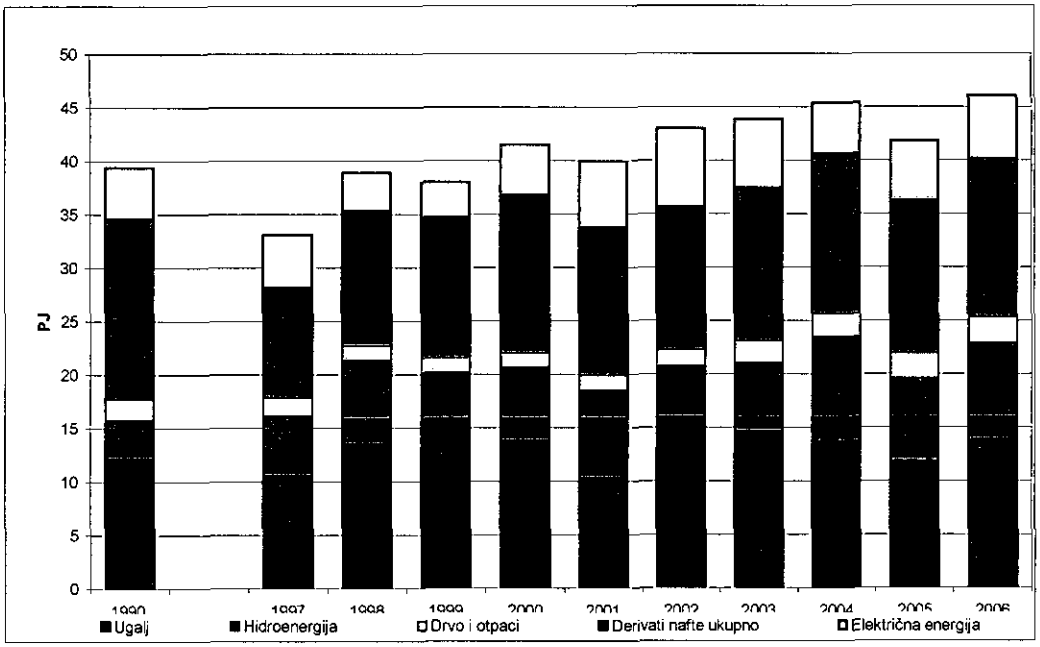
In the period 1997-2006 total consumption of primary energy grew at the average annual rate of 3.7%. In the same period, consuption of coal grew at the average annual rate of 3.0%, and hydro energy grew at 5.4%. Total consuption of oil derivatives grew at the rate of 4,2%.

In the structure of total consumption of primary energy, major share is of oil derivatives (32.3%), coal (30.1%), hydroenergy (19.6%) and firewood (5.3%) (figure1). It means that the share of renewable energy

[3] Quantities expressed in tons of oil equivalents (toe) are used for comparison with Eurostat methodology.

sources in total consumption of primary energy in 2006 was 24.9% which is already higher than the EU objective by 2020.

FIGURE 1: Total energy balance of RoM (1990, 1997-2006)



Source: Energy Institute Hrvoje Požar, IREET Institute: Montenegro EES Development Plan, Ljubljana 2006

5.7. ANALYSIS OF THE ELECTRICITY BALANCE

Realized consumption in the period from 2003 – 2006 shows relatively fast increase of electricity consumption in Montenegro: 2003 – 4.406,1 GWh, 2004 – 4.511,8 GWh, 2005 – 4.543,4 GWh and 2006 – 4.684,7 GWh, or 2.07% per year.

In 2005 peak load vrshno opterecenje in electrical energy system in Montenegro amounted 752,1 MW while minimum load was 361,3 MW, while in January 2007, peak load reached 779 MW.

In 2005, RoM has consumed 4.540 GWh of electricity, with peak load of 752,1 MW and 361,3 MW at minimum load.

Table 1 presents electrical energy balance of RoM for 2005 and 2006. Net production of electricity from domestic power plants in 2006 has increased by 2.5% compared to previous year. Gross consumption of electricity (including total losses) has increased in 2006 by 2.7%, while processing industry shows an annual increase of 3.5%. Consumption of electricity of KAP in 2006 has increased by 1.6%.

Table 1: Electical energy balance of RoM in 2005 and 2006

		2005 *1)*		2006 *2)*		Index
		GWh	PJ	GWh	PJ	2006/2005
1	Production on generator	2,864	10.31	2,952	10.63	3.1%
2	Own consumption of power plants	114	0.41	113	0.41	-1.1%
3=1-2	Net produc. of power plants, *whereof:*	2,750	9.90	2,818	10.15	2.5%
	- HPP Peručica	1,016	3.66	836	3.01	-17.8%
	- HPP Piva	818	2.95	889	3.20	8.6%
	- small HPP(< 10 MW)	23	0.08	19	0.07	-18.7%
	- TPP Pljevlja	890	3.21	1,075	3.87	20.8%
4	Received from Rep. of Serbia *3)*	1,271	4.58	1,204	4.34	-5.2%
5	Delivered to Rep of Serbia *3)*	1,024	3.69	991	3.57	-3.2%
6	Import *4)*	1,587	5.71	1,706	6.14	7.5%
7	Export *5)*	44	0.16	73	0.26	66.4%
8=3+4-5+6-7	**Gross available for energy system**	**4,540**	**16.34**	**4,665**	**16.79**	**2.7%**
9=10+11	Network losses *whereof:*	775	2.79	850	3.06	9.7%
10	- Transfer	175	0.63	157	0.56	-10.5%
11	- Distribution *6)*	600	2.16	693	2.50	15.6%
12=sum (13...19)	Consumption by sectors and voltage level, *whereof:*	3,765	13.55	3,815	13.73	1.3%
13	- energy sector (area 10, 11, 23, 40) *7)*	3	0.01	2	0.01	-27.2%
14	- processing industry (excl 23), *whereof:*	2,312	8.32	2,392	8.61	3.5%
	--- KAP (110 kV)	*1,897*	*6.83*	*1,927*	*6.94*	*1.6%*
	--- Steel plant (110 kV)	*139*	*0.50*	*191*	*0.69*	*38.1%*
15	- construction	4	0.01	6	0.02	*55.0%*
16	- railroad transportation	23	0.08	24	0.09	*6.1%*
17	- household	1,109	3.99	1,097	3.95	*-1.1%*
18	- agriculture *8)*	26	0.09	26	0.09	*1.2%*
19	- other sectors *9)*	288	1.04	309	1.11	*7.4%*

Vir / note:

3) change of energy based on agreement betw EPCG (HPP Piva) and EPS
4) based on commercial agreements and agreements on change of energy (EPCG)and imported dire KAP

6) Real losses have been established only in 2006 (reported increase of 15.6%is not accurate
7) Sectors 10 –mining and querying, 11 – extraction of crude oil and natural gas (excluding

8) Melioration and motors
9) Business and other premises, public lighting, water supply, etc.

5.8. ENERGY EFFICIENCY AND ELECTRICITY LOSSES

Energy efficiency: The overall energy chain in the Republic of Montenegro, starting from use of primary sources, through plants for production, transmission and distribution of energy to transformation and its utilization by end users, is characterized by numerous irrationalities that are the result of: absence of energy strategy in the past, orientation towards energy intensive and often obsolete technology and equipment, inadequate engagement and maintenance of capacities, insufficient technical culture of the energy users, insufficient knowledge and motives to rationally use energy and inadequate price policy of energy products.

Energy sector in RoM is characterized by high-energy intensity in comparison with the EU and other developed countries, which is primarily caused by the high consumption level in aluminum

and steel industry. In 2003, energy intensity of gross consumption of electricity amounted 2,955 kWh/10^3 US$ 2000, which is 8.5 times higher than the EU-15 value - and higher than almost all countries in the region. Intensity of total energy consumption in RoM amounts 1.908 kilograms of oil equivalent/US$ 2000 (GDP), which is 5.6 times higher than the EU-15 average. All of this implies that there is considerable need for energy rationalization.

In 2005 the Government of RoM has adopted the Strategy of Energy Efficiency for RoM. The Strategy is implemented through annual Action Plans that the Energy Efficiency Unit proposes to the ministry responsible for energy. In April 2007, the annual Action Plan for the current year was adopted.

Energy efficiency measures from the Strategy of Energy Efficiency and Strategy of Energy Development by2025 have been recognized as most convenient and unavoidable element of the energy sector development. Economic/energy potential of the introduction of energy efficiency measures, with the decrease of specific energy consumption, is significant, however time period for complete realization of these potentials should be considered, as well as required investments in relevant programs and projects.

Considering the fact that there is no rational valorization of energy greater than the one achieved by decreasing technically unjustified losses, this problem is particularly appealing for this Strategy in the context of energy efficiency.

Electricity losses related to transmission and distribution:

Transmission: According to document "Report on Business Operations of EPCG in 2006", losses of electrical energy (EE) in transmission network of EPCG in this year amounted at 156.6 GWh or 2.7% of gross EE consumption of transmission network (5,720.6 GWh). Electricity losses have a tendency of reduction (3.6% in 2004 and 3.2% in 2005.

Distribution: Total losses (technical and non-technical) of EE in distribution network of EPCG amounted at 693.3 GWh in 2006 or 29.1% in relation to consumption of customers at the distribution level (2,382.5 GWh).

The resulting total losses of EE in transmission and distribution networks of EPCG in 2006 were thus around 850 GWh, which represents 14.9% of gross EE consumption of transmission network, which is an extremely high level of EE losses.

Data on electricity losses in transimission and distribution in 2007 are encouraging and have been decreased below 20% due to activities and measures undertaken by EPCG 20%.

Electric power and energy losses in electricity distribution network of EPCG have always been high, with the drastic increase recorded in the period 1991 – 1998, mainly caused by deep economic crisis, fall of industrial production, price disparity of energy products and organizational weaknesses in electricity distribution sector, related to control and sanctioning of unauthorized EE consumption.

The very social environment, where electricity has been implicitly treated as a social element of the standard, has previously encouraged and "stimulated" inadequate attitude of consumers towards EE, i.e. in addition to technical (unavoidable) losses it has generated the increase of non-technical losses.

5.9. PRODUCTION, TRANSMISSION AND DISTRIBUTION OF ELECTRICITY

Elektroprivreda Crne Gore (EPCG)/Electric Power Company of Montenegro is the sole electric power company in RoM, in which the Government has 70.6% of ownership. EPCG is organized as four functional units: Production, Transmission, Distribution and Supply and has two organizational units: Directorate and Electro-constructions.

Production: Functional unit Production performs production activities. It consists of HE Perucica, HE Piva, TPP Pljevlja power plants and 7 small HPP power plants.
Transmission: Functional unit Transmission performs electricity transmission activities through the transmission network on 110 kV, 220 kV and 400 kV level, electric energy system management

and maintenance and development of transmission network. Within Transmission unit, Market Operator function is temporarily performed. Transmission network is characterised by mainly radial structure on all three voltage levels and good connection with neighboring electric energy systems in Serbia, Bosnia and Herzegovina and Albania.

Distribution: Functional unit Distribution performs transport of electricity through distribution network, maintenance, development and management of this network. There are 16 local distributions in the system, which supply a total of 285,000 consumers. Network development in the past has been based on two degrees of transformation 110/35 kV and 35/10 kV. With the increase of electricity consumption, such concept of distribution network has become insufficient; therefore at the beginning of 80s, direct transformation 110/10 kV has been introduced.

5.10. LIQUID FUEL SUPPLY

Liquid fuel: RoM is entirely importing oil and oil derivatives. In the period 2000-2005, RoM imported 13.3-15.0 PJ or 315,000-355,000 t of oil derivatives. Functioning of companies in the area of oil and oil derivatives is organized as a market activity.

Liquefied petroleum gas (LPG): LPG on the market in Montenegro is currently available in smaller steel containers, smaller containers for service sector and households, and in larger containers for industrial and hotel consumers and as the auto gas. Existing distribution systems are significantly above the market consumption.

5.11. HEAT PRODUCTION

Organization of heat supply: Heat is produced in industrial furnaces and one public boiler room. Industrial furnaces are privately owned by some company owners.

Heat production: In 2004 a total of 3.01 PJ of heat energy has been produced, mainly in the non- ferrous metal industry 2.66 PJ, ferrous metallurgy industry 0.24 PJ, wood industry 0.20 PJ and food industry 0.25 PJ.

5.12. MAJOR CONSUMERS OF ENERGY

When analyzing KAP operations and defining development options, we should have in mind that KAP production (with bauxite mines) makes up over 21% of the total Montenegrin GDP, which illustrates its significance if compared to tourism sector share - 14% of GDP.

In 2006, direct consumers on 110 kV voltage level have consumed 47.3% of total gross production of electricity (including losses), or: KAP - 42.5%, Željezara Nikšič/Steel Plant Niksic - 4.2% and Željeznice CG/Railroads of Montenegro - 0.5%. Remaining 52.7% has been consumed by distrıcution (35 kV, 10 kV and 0.4 kV). In the period 2004 – 2006 KAP consumption remained on the practically same level (1.898 GWh - 1.927 GWh).

5.13. ENVIRONMENTAL ASPECTS

Quality of the environment – current situation: From the general aspect, environmental quality has been preserved, with few disturbances, therefore enabling dynamic, but wise and rationally designed energy and overall development of the Republic of Montenegro.

Domain of environmental requirements is largely determined by natural and ambient values of Montenegro(biodiversity and natural beauty), their current state, risk of irrational use of space and other resources, and ability of nature system to accept, absorb and adjust itself to changed conditions required by the overall social and economic development.

Three regions of RoM (north, central and south) have different environmental features and significantly different requirements regarding environmental protection. While the coastal zone and submarine zone are already showing signs of devastation caused by human activities, north of Montenegro (except Pljevlja region) is subject to devastation that are not as much caused by economic

development.

Montenegrin territory already feels the effects of global warming, reflected in increased drought period and drying of water streams of smaller and larger rivers, which has serious consequences for biotic of river and stream flows. There is a need for specially constructed accumulations that would adequately prevent unwanted effects of global warming. Positive effects of construction of accumulation hydroelectric power plants should be considered in this respect.

Energy and space: Today most significant energy structures in RoM are the following: TPP Pljevlja and Coal mine complex, HPP Piva and HPP Perucica with accumulations, and transmission and distribution infrastructure. Potential locations of new TE and HE on energy-important rivers have been presented in the Draft Spatial Plan of RoM (May 2007). It includes 43 planned and potential accumulations, 11 coal bearings in Pljevlja region and several bearings in Berane and Polic basin, and 69 prospective small HPPs.

Environmental aspects of energy production: There are 3 environmentally most burdened regions in Montenegro: Pljevlja municipality region, Aluminum Plant Pogorica (KAP) and Steel Plant Niksic. Environmental conditions in municipality of Pljevlja region are the result of energy sector activities, while Aluminum Plant Pogorica (KAP) and Steel Plant Niksic environmental problems are caused by energy users/industrial producers.

Burden on the town of Pljevlja is the result of activities in the coalmine, thermal power plants, and particularly smaller furnaces in the town. Due to waste waters from mentioned technologically obsolete plants, local rivers Vezisnica and Cehotina are the most polluted waters surfaces in RoM. Also, coal mine, together with ashes and cinder from TPP Pljevlja is considered as hazardous waste.

Present air pollution (primarily due to the use of engine fuel) and subterranean waters pollution should be quantified and considered when drafting energy development plans.

5.14. SOCIAL ASPECTS AND PRICES OF ENERGY PRODUCTS

Social component of energy is reflected in national distortion of prices of specific types of energy products, in particular electricity prices that are not market priced in Montenegro. This distortion of electricity prices is reflected in cross-subsidising of tariff buyers groups on the low-voltage grid and ability of citizens to pay market price of electricity, which is one of the key factors related to EE system development in Montenegro. Prices of electricity are determined on the cost based principle, however, highest prices are paid by small-scale industry and KAP, as a direct consumer, as oposed to households, which are paing significantly lower electricity prices.

Prices of other energy products (oil derivatives, gas, etc) are in the domain of market values. This is largely due to the inherited practice from previous development period, which has a significant impact on unfavorable trends in the energy sector. This is why active and gradual program for reduction of price distortion is initiated, which will shift prices towards the market level, however it is emphasized that this process should be realized considering socially deprived consumers, which is basically not the responsibility of the energy sector, but the ministry responsible for social care of deprived categories of citizens. Electric power industry activities (direct employment in electric power industry; work in companies that service demanding electric power industries and prospective investment activities) can have significant and strategic impact on social conditions in Montenegro, particularly in the most deprived, north of the Republic. .

However, besides the direct impact of the energy sector through the price of electricity, indirect impact is also important, reflecting in employment (directly in energy sector and in other energy-related sectors), and in the period of construction of new structures, reduction of unemployment can be realistically expected.

With the decrease of energy deficit, Government should consider the option of placing saved funds in appropriate social programs, primarily programs for retraining and continuous training of human resources required for development of the energy sector.

5.15. INFORMATION SYSTEM

Montenegro has adopted principles and action plans of the World Summit on Information Society (WSIS), Strategy of Information Society Development from 2004 and Strategy of Electronic Communication Sector in Montenegro.

However, there are notable problems related to development of informatics program solutions that support energy and other industries.

In the energy sector, The Law on Energy, and in other areas (Law on Spatial Regulation, Law on Construction of Buildings, Law on Construction Land, Law on the Environment, Law on Waters) do not stipulate the obligation to collect and update the data, which can be considered as notable weakness in this stage of overall development of Montenegrin society. Therefore, it is necessary to foresee changes in legislation in all mentioned areas with an aim to improve the current situation.

6. KEY ASSUMPTIONS FOR THE STRATEGY

In accordance with developemnt decisions of Montenegro, the focus of economic policy will be to accelerate growth and development and to strengthen the competitive capability of the economy. Basic directions of activities are oriented towards the development of the entrepreneurship and growth of investments in all areas, and in particular in tourism, infrastructure and the energy sector, while respecting regional development components.

The Strategy will be realized through investment projects for generation and energy infrastructure facilities. Various forms of cooperation with international institutions and implementation of contracts with strategic corporations in the energy field, privatization program and public-private partnership, undoubtedly represent a reliable way to achieve the highest multiplier effects to the overall development of the state of Montenegro.

Consideration of resources, main parameters determining the general development of Montenegro and their implications on the strategy of the overall development of the State, resulted in definition of following key assumptions for the development of the Strategy:

- Acknowledging the risk that generation and transmission of the energy may become the critical issue in the region, the Government of the RoM is undertaking firm measures in order to reduce that risk, on the local as well as on the regional and international level;
- Strategy represents a complex management mechanism with main goals defined in the adopted Energy Policy of the RoM;
- Efficient use of energy is of the key importance and should be given priority in implementation of the Strategy;
- It is expected that the implementation of the Strategy will provide for increased interest of investors and the growth of the volume of foreign direct investments in the energy sector in the RoM;
- Energy development is a realistic and potential driving agent for ecological-sustainable overall development of the state of Montenegro;
- Existence of the experts (energy companies, University, Academy of Science) that have required knowledge to implement the Strategy;
- Transparent adoption and update of the Strategy as well as transparent monitoring of its realization;
- Safe, secure, reliable and quality energy supply of consumers at realistic prices;
- Eliminate the dependency of Montenegro from the import of electrical energy by rational use of available hydro and thermo potentials;
- Reach agreement with neighboring countries on issues related to the use of hydro potential:
  - Water use and management,
  - Water transferring,
  - Division of shared hydro potential,
  - Division of energy effects created as a result of accumulations in Montenegro for downstream users,
- Energy infrastructure built in accordance with sustainable development and environmental protection requirements,
- Created conditions for better use of renewable energy source, cogeneration, replacement of some energy sources, reduction of energy losses and improvement of energy efficiency,
- Energy companies and consumers operate on the open, competitive, local and regional market,
- Legislation of the RoM and its harmonization with the EU regulations,
- Participation of the general public in decision making related to energy development.

7. DEVELOPMENT OF ENERGY OF MONTENEGRO BY 2025

7.1. INTRODUCTION

7.1.1. Existing scenarios, plans and strategies of the overall development of Montenegro

Period of transition of Montenegro from the state union to an independent state is marked by intensive activities of multi-component planned development, which includes drafting of numerous strategic documents on: development of specific important economic sectors, sustainable development, environmental protection, and as the most important – Spatial Plan of Montenegro. National Strategy for Sustainable Development of Montenegro has been adopted; development plan for EPCG will be adopted, as well as the plan for privatization of the energy sector, construction and development, and specific plans in the area of environmental protection.

All planned document, which rely heavily on modern European and international experiences and relevant development plans, emphasize the significance of environmental for Montenegro, the need for sustainable development, underlining the use of environmental advantages of the state and accession to Euro-Atlantic integration process.

In all plans and development strategies Montenegro is regarded as a modern and regulated democratic state, fully integrated in Europe, ensuring its progress within sustainable development framework.

Regarding existing strategic solutions in the energy sector, it is planned to stabilize operations of electrical energy system of Montenegro (EES CG), with the decrease of electricity deficit, which will be achieved through:

- Revitalization and optimization of existing production, transmission and distribution structures, with the objective of achieving safe and regular supply of users on already reached production level,
- Construction of new electricity sources, including most efficient technologies for energy transformation, therefore minimizing environmental pollution and eliminating the deficit.

Energy sector, both from the aspect of production and from energy consumption aspect is of essensial inportance for sustainable developemnt of Montenegro. This is due to the fact that supply of sufficient energy on one hand, represents a precondition of economic development and satisfactory living standard, while on the other hand, it required to minimise impacts of production and consumption of energy on the environment.

7.1.2. Water industry aspects

Water resource of Montenegro is its key resource, which has a potential to be a bearer of the overall development of the state. The essence of this resource is management and strategic overview of water resource value in the broader Mediterranean region. Montenegro considers these issues as very important and it has included them in the Water Industry basis of the state.

However, the impression is gained that the positive effect noticeable in construction and exploitation of hydro energy structures and accumulations has not been sufficiently considered, yet it is prominent and reflected in improvement of micro-climate conditions, through stimulation of development of specific types, avoiding or mitigating natural environmental disasters, enabling development of specific economic activities and contributes to quality of living of population affected by prospective changes.

7.2. RESERVES IN THE EXISTING ENERGY SYSTEM – REVITALATION AND RECONSTRUCTION OF EXISTING FACILITIES

Revitalization and reconstruction of existing facilities that are approaching the end of their life cycle, is an option recommended in the Strategy due to several reasons:

- Financial means required for revitalization of facilities are, as a rule significantly lower than funds required for construction of new facilities of similar characteristics,

- Revitalization of existing facilities doesn't impose new requirements regarding the use of space, i.e. choice of location, which is of particular importance at present, as local communities attitude towards construction of electric power plants is still undefined,
- Location of revitalized facility is put into use again, without the need to find solutions regarding the manner of location rehabilitation, upon expiration of the plant life cycle,
- Increasing the level of EE production, i.e. improving performance of electrical power plants.

Regarding HPP, revitalization is, as a rule, performed as a single continuous process, with periodical replacement and renewal of equipment and facilities, which enable plan readiness and projected (or increased) level of EE production. In such manner once the location is used, as a rule, it is continually maintained in function, which is the only reasonable solution, sue to the limited number of quality locations and high initial investments in HPP facilities.

Regarding TPP, once the location is obtained it is kept in function, where it is possible to choose between construction of new facilities, i.e. blocks, and reconstruction of the existing ones. Locations with older blocks within plants (over 30 years old) of lower power and relatively obsolete technology, new units are usually constructed, while for more modern blocks of higher power, revitalization and reconstruction is generally a better solution. Specific decision obviously depends on precise characteristics of individual location, i.e. plant.

Until 2025, the following plants will be operational: HPP Perućica (307 MW), HPP Piva (342 MW) and TPP Pljevlja (210 MW), as well as 7 smaller HPP of total power of 868 MW.

The Strategy envisages major revitalization of three large power plants: HPP Perućica, HPP Piva and TPP Pljevlja, as well as small HPP.

If investments funds required for revitalization of all three existing EPP and smaller HPP, excluding prospective addition of new aggregates are summed up, conditionally, the amount of around 166 million EUR (with ecological stabilization of TPP Pljevlja) is obtained, as well as the increase of EPP power by 37 MW.

The Strategy is also recommending intensification and completion of analysis for the option to build in the eight aggregate in HPP Perućica of 58,5 MW, which would imply total increase of existing power of EPPs by 95,5 MW. Value of investment is approximately 14 million EUR.

Table 2 illustrates power plants planned for reconstruction and revitalization, improvement of their performances following revitalization, and required investments.

Table 2: Existing production facilities – planned reconstruction and revitalization

Year	Existing facilities		Power/MW		Power increase (MW)	Investments (mil. EUR)
			Before revitalization	After revitalization		
2008	Small HPP		9	9	0	4
	TPP Pljevlja 1		210	225	15	43
	HPP Perućica	Old aggregates	285	307	22	35
		New aggregates	58,5	58,5	58,5	14
2010	HPP Piva		105	105	0	70 *1)*
Total			**609**		**95,5**	**166**

Source: IREET Institute, Ljubljana 2007

Note: 1) Planned revitalization of aggregate without the increase of power.

7.3. STRATEGY FOR EFFICIENT USE OF ENERGY

Strategy for Energy Efficiency and related Action Plans (annual for 2006 and 2007 adopted by the Government, and long-term Action Plan by 2012, whose adoption is planned by the end of 2007), have preceded final stage of drafting of the Strategy. Prioritizing in such manner increase of energy efficiency, Government has clearly expressed its position, which had a significant impact on the Strategy. In that regard, work on the models for balance analysis included potentials and alternatives of energy efficiency, regarding them as applicable and binding for the Government activities during the implementation period of the Strategy.

As part of the process of harmonization of national legislation with EU legislation will be necessary to adopt new regulations and standards in the area of energy efficiency. Considering significant stagnation in the area of rational use of energy and its importance for economic and social development of Montenegro, in the initial phase a special Law on Energy Efficiency should be adopted. Law would define terminology in the area of EE, goals, priority areas and administrative functional responsibility of the institutions of the authority as well as obligations of other participants, generators, supplies and users of energy, in terms of implementation of the Energy Efficiency Strategy.

Goals of the adopted Energy Efficiency policy of Montenegro are:

- Identification of different types of energy lowest total costs and measures for improvement of existing systems;
- Creation of economic incentives for energy savings,
- Preparation of comprehensive strategy and legal documents;
- Increase of information on energy efficient technologies and application methods along with the international cooperation.

Basic direction of activities:

- Establishment of basic framework for energy efficiency (Law on Energy Efficiency, central Institution for energy efficiency and Fund for energy efficiency), as well as gradual development of the overall legislative and institutional framework for energy efficiency,

- Implementation of sector programs for energy efficiency, including provision of incentives, technical support and promotional/marketing activities,
- Promotion of investments in the area of energy efficiency, through mobilization of international financial support, state and local funds, and private capital.

Simultaneously, activities for development of local capacities and service in the area of energy efficiency, research and development, and promotion of local production in the area of energy efficiency should be implemented.

Measure for more efficient production of EE have been considered in relation with planned reconstruction and rehabilitation of existing electrical energy facilities (HPP Perućica, HPP Piva, TPP Pljevlja), as well as requirements for application of higher technical standards in the industry (KAP, Steel Plant/Željezara Nikšić and Railroads of Montenegro/Željeznica Crne Gore) and for construction of all new facilities. Considering different structure of energy requirements and problems of different sectors, priority in implementation of energy efficiency measures is given to the following sectors:

- EPCG (as a supplier) and main users (KAP and Steel Plant/Željezara Nikšić) should be treated through separate energy efficiency programs;
- Buildings sector (residential, commercial and public buildings) should represent a priority for implementation of effective measures of energy efficiency;
- Transportation, as an important sector from the aspect of energy consumption, should also be treated through integrated plans for energy efficiency;
- Other industries (excluding two mentioned major users) represent minor consumers. Measures of energy efficiency for this user category should, also, be directed to increase of competition and establishment of sound basis for development of energy efficiency.

As a short-term priority, it is recommended to: introduce specific Law on Energy efficiency, prepare expert analysis ("*Energy Audits*") of major users (KAP, Steel Plant Niksic and Railroads of Montenegro) from the aspect of rationalization of energy consumption and updating of the Energy Efficiency Strategy.

In addition to definite financial benefits, improvement of energy efficiency has numerous other advantages, in particular positive effects on the environment, however, it should be emphasized that improvement of life quality, even under efficient energy use conditions, is followed by the increase of total consumption, particularly in the households sector.

Increase of energy efficiency is not a "panacea" and cannot solve problems arising from significant energy misbalance, however, energy efficiency should be considered, not only as an option, but also as a commitment in line with this Strategy.

Considering detailed elaboration of programs and specific activities in the area of energy efficiency described in the Energy Efficiency Strategy, this document is providing only basic information, as these two documents are regarded as inter-related by their nature, and in a certain manner condition their mutual implementation.

7.3.1. Public sector

Two areas are important in the public sector: planning and implementation of sustainable energy development of local communities in terms of energy supply and rational energy management in public buildings. Certain potential exists in the public sector both for improvement of energy efficiency and for the use of renewable energy sources and cogeneration.

7.3.2. Households

Households are one of the largest energy consumers after industry and traffic. Practically, in Montenegro there is a large number of residential buildings and houses where is possible to significantly reduce the energy consumption. Dominant share of the electric heating in households, approximately 66% of needed heating energy, is realistically area for application of numerous energy efficiency measures. Reviewing this realistically, it is not a simple task to present to a Montenegrin household and consumer, a topic "efficient energy consumption" and it will take some time to achieve proper results.

7.3.3. Industry and economy

Industry, service sector and small producers represent the largest energy consumer in Montenegro, and contribute to the great extent to the pollution of the environment as well. It is possible to reduce the energy consumption with more rational energy use and application of modern production and energy technologies (KAP, Steel Plant Niksic, Railways) in this sector and by that to increase the competitiveness and reduce negative environmental impact (based on detaild studies that should be prepared)

7.4. FINAL ENERGY CONSUMPTION UNTIL 2025

7.4.1. Scenarios of Gross Domestic Product (GDP) development

Due to different approach in calculation of the GDP per capita, as a key macroeconomic indicator of the development of the RoM, three scenarios of the GDP increase were developed, which were used to forecasting final energy demand until 2025:

- **Low** scenario which envisages long-term average annual economic growth of 4.3% until 2025
  (according to the scenario of the economic growth of the ISSP Institute from Podgorica);
- **Medium** scenario that envisages the economic growth rate of **6.3%**,
- **High** scenario that envisages the growth rate of **7.7%** (according to the economic development in the proposed base Studies of the Spatial Plan of the RoM).

The Strategy is, as follows, based on the Medium scenario of final enerfgy consumption, while Professional Basis includes: Low, Medium and High scenarios of final consumption.

Considering that High and Low scenarios represent maximum possible values of energy consumption, they are treated as extreme values in forecasting merthodologies, which means that real consumption ranges between mentioned limits, coresponding to the Medium scenario.

Additionally, Medium scenario shows the recent trend of economic development (GDP), since the growth rate is approximatelly 6%, on which the mention scenario is based.

Medium scenario is based on the most realistic degree of introduction of latest technologies, substitution of fuel and energy efficiency measures, integrated in MEDEE/MAED model (Table 1).

7.4.2. Main assumptions for calculation of the final energy consumption

GDP growth and change of its structure, increase of population, volume of transport activities, changes in habits and standard of living as well as introduction of energy efficiency measures in final energy consumption sectors are those with the highest impact on the increase of the energy consumption:

a. **Growth of GDP**: GDP per capita will increase from 2.260 EUR/cap in 2003 to 5.539 EUR/cap (Low), 8.377 EUR/cap (Medium) and 11.216 EUR/cap (High) until 2025.

b. **GDP structure:** Share of some sectors in the baseline year, 2003, was: industry – 12%, transport - 10%, agriculture - 12%, construction – 4%, services (including also tourism) – 62%. Until 2025, depending on the scenario, share of the industry will be increased (15-17%), slightly will increase the transport as well 11%, while the share of agriculture will decrease (7-9%), construction will stagnate (4-5%), while the share of service sector will be increased (63%). The growth of the share of tourism and hospitality industry will grow from 2.6% annually to 3.9% until 2025. Untill 2005 industrial product would increase from 3 to 7 times, and would grow at the rate from 5.3 to9.5% annually.

c. **Stanovništvo**: Long-term growth of the population is envisaged at the annual rate of 0.25% in the High scenario, in the Medium at 0.16%, and in the Low scenario at 0.07% annually.

d. **Volume of transport activities**: Significant increase of cargo transport from 2 to 3 times, increase of traffic at the Port of Bar, and resumption of the railway

transport intensity, further increase of truck-traffic, while the inter-city mobility of population will be doubled.

e. **Households**: An increase of standard of living is envisaged, which will lead to an increase of energy demand. Depending on the scenario, the total number of residential buildings, share of new residential buildings, share of apartments with central heating/cooling systems, share of total heated surface of buildings and share of residential buildings with cooling systems will increase (50-80% depending on the scenario). The consumption of hot water per capita will increase for 50%, and energy for cooking will decrease for approximately 20%, until 2025.

f. **Measures of energy efficiency and introduction of renewable energy sources**: Measures for reduction of energy intensity are envisagedl in all final energy demand sectors, depending on possibilities for introduction of new /efficient processes and technologies. Introduction of renewable energy sources is particularly envisaged in the sector of service activities and in households through systems for use of solar energy for hot water preparation and heating of premises (collectors and solar architecture).

Table 3 illustrates basic elements of the scenario in the MEDEE/MAED model for forecasting of final energy consumption. Final energy consumption is greatly influenced by future technologies, forecasts of the growth of GDP, population and prospective substitution of energy sources. Energy sector of Montenegro is marked by very large share of electricity; therefore model envisages substitution of electricity for heating purposes with TNG that represents a predecessor of natural gas.

Table 3: Basic scenario elements for forecasting final energy consumption

	"High"	"Medium"	"Low"
GDP increase (%)	7.7	6.3	4.3
Population increase (%)	0.25	0.16	0.07
Technology	Extremely ecological scenario – application of exceptionally energy efficient technologies and renewable sources of energy	New technologies scenario and active state measures 1)	Classic technologies scenario, without active state measures
Fuel substitution			
Agriculture	Biodiesel share 15%, heat: substitution of liquefied fuel with TNG - 34% solar energy - 15%	Biodiesel share 11% heat: substitution of liquefied fuel with TNG - 15% solar energy – 10%	Biodiesel share 5% heat: substitution of liquefied fuel with TNG - 10% solar energy - 5%
Construction	Biodiesel share 9 %, Coal substitution with TNG – 34%	Biodiesel share 5 %, Coal substitution with TNG – 20%	Biodiesel share 3%, Coal substitution with TNG - 16%
Industry	High temperatures: Heating oil substitution with TNG - 40% Low temperatures: Cogeneration share - 60% Boiler rooms: Heating oil substitution with TNG – 30%	High temperatures: Heating oil substitution with TNG - 20% Low temperatures: Cogeneration share - 40% Boiler rooms: Heating oil substitution with TNG –15%	High temperatures: Heating oil substitution with TNG - 5% Low temperatures: Cogeneration share - 10% Boiler rooms: Heating oil substitution with TNG – 8%
Transportation	Biodiesel share 10%	Biodiesel share 5%	Biodiesel share 3 %
Households	heating: substitution of wood with TNG - 30% hot water: substitution of electricity with TNG - 30% cooking: substitution of electricity with TNG – 30%	heating: substitution of wood with TNG - 26% hot water: substitution of electricity with TNG - 26% cooking: substitution of electricity with TNG – 26%	heating: substitution of wood with TNG - 16% hot water: substitution of electricity with TNG - 16% cooking: substitution of electricity with TNG - 16%
Services	heating: substitution of heating oil and electricity with TNG - 26%	heating: substitution of heating oil and electricity with TNG - 17%	heating: substitution of heating oil and electricity with TNG - 9%

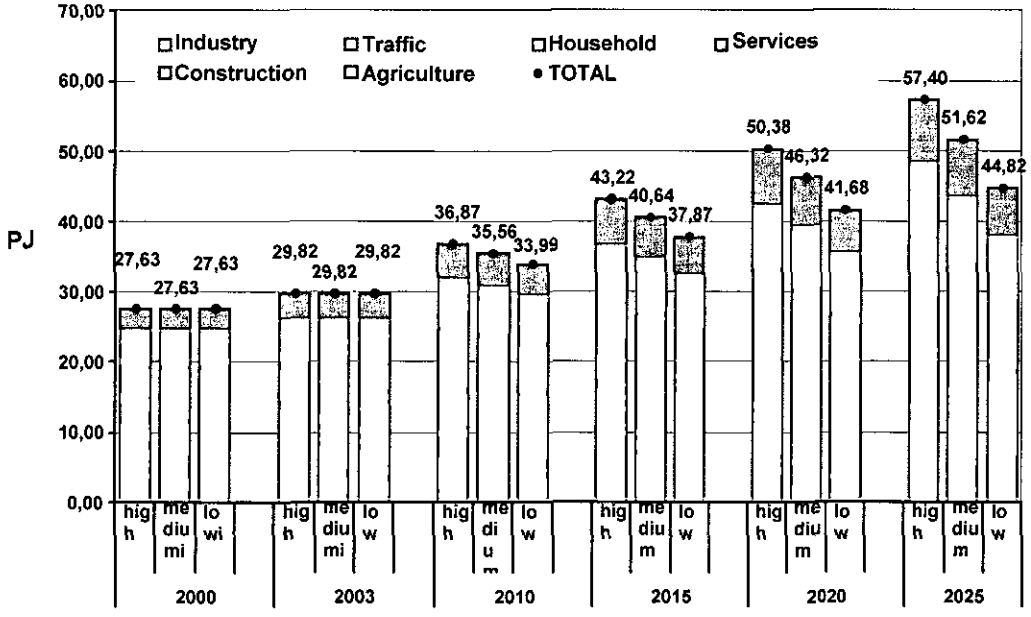
Source: IREET Institut, Ljubljana 2007.

Note: 1) *"New technologies and active state measures Scenario" implies gradual introduction of technologies with significantly higher standard level of energy use then the existing technologies (e.g. in households and other consumption: energy efficient devices, better use of energy for heating purposes; traffic: decrease of specific use of fuel, higer share of diesel cars; industry: more efficient engines, better use of waste heat and energy processes; other: decrease of heat losses of buildings, more efficient lighting, use of solar plants and heat pumps, use of passive architecture, etc.). Faster implementation of energy efficiency plans requires significant measures of support and direct incentives from the Government.*

7.4.3. Consumer structure and forecast of final energy consumption by scenarios

Forecast of final energy demand of RoM was conducted by a procedure that enables capturing of impacts of all relevant generators / drivers of energy consumption (MEDEE model). Forecasts and analysis were performed for individual consumption sectors: industry, traffic, public sector and households, agriculture and construction, as for all forms of energy as well. (Figure2).

FIGURE 2: Consumer structure and forecast of final energy consumption by scenarios



Source: IREET Institute, Ljubljana 2007

Total final energy consumption: will grow from 29.82 PJ in baseline year 2003 to 57.40 PJ in the last observed year for the High Scenario, or 51.62 PJ for the Medium and 44.82 PJ in Low Scenario. Realized average growth rate of the consumption for the total final energy for baseline year - 2003 to the last observed year – 2025 in the **High** scenario is **3.0%**, in the **Medium** scenario is **2.5%** and in the **Low** scenario **1.9%** annually, which indicates significant improvement in terms of reduction of energy intensivity, i.e. reduction of the final energy consumption per GDP unit for all scenarios.

Industry: Significant change of shares of industrial sectors in total GDP of industry is foreseen. It is assumed that ferous and non-ferous metal production will decrease significantly. Share of base industry, textile and food industry will remain within approximately unchanged values in the observed period. Share of other least-energy intensive industry (production of machines and devices, production of electrical and optical devices, production of transportation means, etc.) will increase significantly. Consumption will increase from 14.07 PJ in the baseline year – 2003 to 23.91 PJ in the High scenario, 21.59 PJ in the Medium scenario and 18.52 PJ in the Low scenario. Average annual growth rate of the final energy consumption in the High scenario is 2.4%. In the Medium scenario amounts to 2.0% and in the Low scenario is 1.3% annually.

Traffic: Consumption will increase from 5.7 PJ in the baseline year – 2003 to 13.8 PJ in the High scenario, or 1.7 PJ in the Medium and 9.7 PJ in the Low scenario. Realized average annual growth rate of the consumption of useful energy in traffic in the High scenario is 4.1%, and in the Medium and Low scenario 3.3% and 2.4% respectively

Public sector and households: Households' consumption will increase from 6.32 PJ in the baseline year to 10.58 PJ in the last observed year for the High scenario, or 10.2 PJ in the Medium scenario or 9.62 PJ in the Low scenario. Realized average annual growth rate in the High scenario is 2.4%, in the Medium scenario 2.2%, and in the Low scenario 1/9%. Total consumed energy in the service sector will grow from2.99 PJ in the baseline year to 5.83 PJ in the High scenario, or 5.52 PJ in the Medium scenario or 5.21 PJ in the Low scenario. Realized average annual growth rate in the High scenario is 3.1%, in the Medium 2.8%, and 2.5% in the Low scenario.

Agriculture: Consumption will grow from 0.30 PJ in the baseline year – 2003 to 0.76 PJ in the High scenario, or 0.69 PJ in the Medium or 0.53 PJ in the Low scenario. Realized average annual growth rate of the final energy consumption in agriculture in the High scenario is 3.2%, in the Medium and

Low scenario 2.7% and 1.7% respectively.

Construction: Total final energy consumption in the construction will grow from 0.42 PJ in the baseline year – 2003 to 2.54 PJ in the High scenario, or 1.90 PJ and 1.25 PJ in the Medium and Low scenario respectively. Realized average growth rate of final energy consumption in construction is 7.5% in the High scenario, and in the Medium and Low scenario 6.2% and 4.5% respectively.

In 2006 total GDP of RoM amounted 1,778 billion EUR, with the GDP per capita of 2.790 EUR, which represents real growth rate of 6.5%. In the period from 2001 – 2006, GDP growth rate had a constant growth trend (2001: -0.2%, 2002: 1.7%, 2003: 2.3%, 2004: 3.7% and 2005: 4.1%). Based on the analysis of the growth rate in the period from January – September 2007, increase of over 6.5% is expected. This means that GDP growth rate is realistically approaching growth rates envisaged in the Medium scenario of the White Paper.

Inflation rate in the same period had a downward trend (2003: 6.2%, 2004: 4.3%, 2005: 1.8% and 2006: 2.5%). Majority of other macroeconomic indicators have shown a positive trend in 2006.[4]

7.5. DEVELOPMENT OF USE OF HYDRO POTENTIAL

Montenegro has a hydro-energy potential, which is considered among world's top according to the Index of Strategic Priority (ISP) considering its economy and suitability for ecological and social environment. Out of its total hydro energy potential on the main water currents of 9.846 GWh, Montenegro is exploiting less than 1.800 GWh (HPP Perućica and HPP Piva), i.e. somewhat more than 17%. However, it should be considered that the limiting factor for exploitation of water resources is the fact that part of river Tara flow is located in the national park Durmitor, which is on the list of the UNESCO World natural heritage and the basin of river Tara is included in biosphere reserves of UNESCO programs.

Depending on the approach to water utilization, estimate of the amount of technically usable potential of main water course outflow direction ranges from 3.7 do 4.6 TWh, while if the approach is to redirect part of waters from river Tara to river Moraca (22.2 m^3/s), technically usable potential would amount from 4,6 to 5,3 TWh.

Besides above mentioned hydro potential that can be used for construction of production plants of higher capacity on the territory of Montenegro, there is also hydro potential of small watercourses that provide excellent opportunity for energy exploitation through construction of small HPP power plants (up to 10MW), and hydro potential outside Montenegrin borders, which represents hydro energy potential established on the territory of Montenegro, whose realization is possible partially or completely outside its borders.

Even though hydro potential is of enormous significance (even of key importance) for overall energy perspective of Montenegro, hydro potential consists of only a part of total water resources of Montenegro. Water resource (water for human needs, ambient characteristics, economic potential, microclimate improvements and specific regulator in the environment preservation system) has the highest strategic value for the development of Montenegro, and is an area where quality contribution can be offered for the regional development.

7.5.1. Theoretical potential

Based on previous research of watercourses in Montenegro, it can be concluded that Montenegro has extremely rich water resource compared to its relatively small territory, thus having general availability of significant hydro potential for energy utilization. Total hydro potential on the territory of Montenegro through the dimension of annual outflow of domestic waters is estimated at around 18,75 billion m^3 i.e. 595 m^3/s, while from the aspect of hydro energy utilization, estimate is 13,34 billion m^3 or 423 m^3/s. Water industry basis of Montenegro defines average theoretical hydro energy potential in the amount of

[4] Increase of foreign direct investments to 502 million EUR, decrease of unemployemnt rate to 15.5%, while the balance of payment deficit expressed as percentage of GDP amounted 2.1%-3.1% (2004-2005) and external trade balance deficit deficit amounted 360 million EUR.

9.846 GWh, with 17% of this potential included in commercial exploitation. Distribution of this potential according to main watercourses is presented in the following Table 4.

Table 4: Theoretical hydro potential of Montenegro on main watercourses

Watercourse	Theoretical hydro energy potential (GWh)
Piva	1.361
Tara	2.255
Ćehotina	463
Lim	1.438
Ibar	118
Morača (up to Zete)	1.469
Zeta	2.007
Mala rijeka	452
Cijevna	283
Total	***9.846***

Source: IREET Institute, Ljubljana 2007

In order to use hydro potentials and to construct hydropower facilities on water courses, running through several countries, Montenegro has to reach agreement with interested neighboring countries (Serbia, B&H, Croatia) on more specific use of hydro potential in watersheds of these rivers, based on mutual strategic interests and technical documentation developed in advance, and respect interests of downstream countries in accordance with the provisions of international law covering the area water resources.

It is recommended, as part of procedures and undertaking of specific activities, including new decisions related to the construction of hydropower plants, which have to be accompanied with single integral planning of use of resources, to carefully review other existing energy studies, including the overview of energy consumption (losses), renewable energy sources. Furthermore it has to be taken into consideration that small power plants cannot provide adequate quantity of electrical energy (not even in the scenario of improved energy efficiency and efficient use of existing sources).

Finally, it is necessary to take into consideration positive effects of construction of water accumulations, existing conditionality linked with the Tara Declaration (UNESCO protected area), as well as real possible effects of valorization of these resources (rafting, eco-tourism and similar).

Studies of environmental impact assessment for specific projects have to be developed in accordance with acceptable international standards and scientific procedures, taking into consideration as well EU Directives that regulate the preparation of Studies of environmental impact assessment (EIA), in particular for construction of large hydropower plants (with accumulation of more than 10 million m^3) in domestic and cross border context. All legal aspects, in this case, should have to be in line with existing national legislation of those countries, as well as with relevant international agreements.

7.5.2. Use of hydro potential

Professional basiss includes analyis of overall hydro energy potential, however, out of all considered groups of HPP on individual watercourses, having in mind Declaration of UNESCO and of the Parliament of the RoM on river Tara protection, the Strategy recommends HPP on river Moraca and HPP on river Komarnica, as energy and economically most attractive and most researched.

Therefore, out of all currently considered scenarios of use of hydro-potential of Montenegro, the Strategy envisages the so-called Scenario of "moderate construction" according to which the following construction in period until 2025 is planned:

- **HPP on the Moraca** River of total power 238.4 MW, generating 693.7 GWh/ annually,
- **HPP Komarnica** of power 168 MW, generating 231.8 GWh/ annually.

Planned investment by 2025 amount 565 million EUR.

Additionally, there are projects like HPP Boka, for which a more detailed research on available potential is required.

In accordance with solutions provided during the Public Debate, it is required to analyze and process HPP Kruševo through the Action Plan.

In compliance with the Law on Energy, the Strategy should be revised at least every five years (until 2012). Therefore, next revision of the Strategy will include detailed analysis of demand for electricity in Montenegro, situation in the SEE region in the area of construction of new and revitalization of old production and transmission facilities, situation on the electricity market (competitiveness, prices, security of supply, etc.) and examine possibilities and needs for construction of additional hydro energy facilities on the territory of Montenegro, recognized and analyzed in Professional Basis.

7.6. DEVELOPMENT OF USE OF COAL RESOURCES

7.6.1. Coal reserves

In addition to hydro potential, coal is the most important energy resource in Montenegro. Coal reserves in Montenegro are located in Pljevlja and Berane basin. Degree of coal exploration is high in Pljevlja area, while it is insufficient in Berane.

Pljevlja area: Total exploitation reserves in Pljevlja area amount around 71.5 million tons, Maoce basin around 113 million tons, while total exploitation reserves amount 184.5 million tons. Considering data obtained from the previous period, it is required to perform detailed analysis and determine preconditions for exploitation of coal reserves in Pljevlja basin and update data on reserves and preconditions for utilization of coal from Maocki basin.

Brown coal and lignite mine in Pljevlja area is managed by the company Rudnik Uglja AD Pljevlja, shareholding company, whose 68.9% shares are non-state owned, i.e. privately owned, while the remaining 31.1% of shares are still state owned.

Berane area: Brown coal bearing of around 28 km^2 of surface area is located in Berane coal basin and around 18 km^2 is located in Polic coal basin. Geological reserves amount around 158 million tons, however, due to insufficient research, total presumed exploitation reserves have been estimates at only approx 18.5 million tons. Company Rudnik Mrkog Uglja "Ivangrad" AD – Berane, which was privatized / sold to a foreign investor in mid September 2007 (after having been under bankruptcy since 2004), is responsible for coal exploitation in Berane basin. Concession agreement has been signed with the foreign investor for the period of 20 years.

Additional research are underway, as well as defining level of exploitation reserves and depending on results, private sector interest for further development of the mine will be establsihed.

7.6.2. Use of coal

The Strategy envisages the use of coal only from Pljevlja region, with its dominant use in the thermo-power plants for generation of electric energy and eventually for heat energy.

TPP Pljevlja 1 and 2: After 2009 and until 2025 production of coal would be executed on the open pit Potrlica, including as well the site Cementara. Using data on exploitation reserves, taking into consideration average thermal value of coal, it could be concluded the coal reserves in the Pljevlja basin with its gravitating basins, are enough to supply TPP Pljevlja 1 (210 and 225 MW after reconstruction) until the end of the expected exploitation life of the block, after which its capital reconstruction and rehabilitation is planned, as well as to supply TPP Pljevlja 2 (225 MW) with coal for its expected operation life of 40 years.

Start of the operation of TPP Pljevlja 2 is envisaged for 2011. Annual coal consumption of both blocks will be between 2.5 and 2.8 million tons.

Heating System of the city of Pljevlja: There are some 40 boiler rooms in the city of Pljevlja, in which the coal from the Pljevlja region is used for generation of heat energy. Introducing central heating system for the city of Pljevlja, the volume of use of coal in decentralized boiler rooms will be significantly reduced and consequently current negative environmental impact.
Available natural resources in Montenegro, and perspectives of energy development in the world as well, indicate that the guidelines for development of coal in the future should be linked, along with improvement of the state of exploration of reserves, modernization and rationalization of the coal mine operations and responsible management of coal reserves, with maximum recognition of environmental protection standards in accordance with European legislation.

TPP Berane: Strategy envisages possibility of construction of mentioned thermal power plant, considering that the mine has been sold to the new owner, who is obliged to invest certain amount of funds in the mine and is expressing interest in construction of new thermal power plant block of around 100 MW (if the investment is proven to be economically profitable in market conditions).

Considering that additional research are underway, as well as defining of the level of exploitation reserves, depending on the outcome of these activities, interest of the private sector for further development of the mine and prospective construction of this production facility on this location will be determined.

Planned investments for TPP Pljevlja 2, Coal Mine Pljevlja and heating system of the city of Pljevlja until 2025, amount 274 million EUR.

7.7. DEVELOPMENT OF LOCAL ENERGY, COGENERATION AND HEAT ENERGY SUPPLY

With the Strategy of introduction of cogeneration and dismantling of barriers to its development, EU has defined cogeneration as most appropriate technology for efficient use of energy of traditional fossil fuels and reduction of gases with greenhouse effect in its Strategy to promote cogeneration and dismantle barriers to its development.

Strategy of introduction of cogeneration: Industrial cogenerations are envisaged for Montenegro (for larger consumers that have constant heath consumption) and small cogenerations for the service sector (hospitals, hotels, trade centers, handicraft stores) and larger residential blocks. Fuel for cogenerations will be TNG and liquefied fuel if there is no natural gas.

In the period until 2025 a replacement of a part of industrial boiler rooms is planned with industrial cogenerations using liquefied petroleum gas (LPG) and liquid fuels. In accordance with the final consumption scenarios, such replacement would be at 60% for High, 40% for Medium and 10% for Low scenario.

Generation of industrial cogenerations in 2025 for all scenarios would be as follows: for High scenario heat energy 4.18 PJ and electrical energy 446.07GWh; medium: heat energy 2.25 PJ and electrical energy 240.54 GWh; and Low scenario: heat energy 0.44 PJ and electrical energy 46.53 GWh.

In the context of introduction of remote heating system in the city of Pljevlja it is planned to remove heath energy from the new II block of thermal power plant TPP Pljevlja, providing TPP Pljevlja 2 with cogeneration function. Since it is assumed that the manner of thermal aggregate will not have a significant impact on the balance of available energy and energy from power plants, this facility is mentioned through the Strategy as TPP Pljevlja 2.

Development of other public cogeneration of larger capacities is not envisaged except for smaller cogenerations with biomass that are of local importance.

Strategy of heat energy supply: Potential markets for the remote heating system (cities for construction of the remote heating systems) are primarily estimated based on the site: Pljevlja and Niksic, and to follow Bijelo Polje, Cetinje and Berane, and in smaller local communities in the municipalities of Kolasin, Zabljak and Pluzine, but only if it is case of recovery of industrial processes

waste heat, waste burning or use of biomass. Introduction of the heating system in the city of Pljevlja is planned in the Strategy.

Strategy of development of local energy systems: In the area of communal energy in the RoM until 2025, potential remote heating systems were considered, as well as public boiler rooms and natural gas supply systems, as their introduction is considered to be realistic in the observed period.

Modernization of existing boiler rooms using coal envisaged as well as gradual coal substitution with liquid gas.

7.8. SUPPLY OF LIQUID FUELS

7.8.1. Oil and gas potential in the Republic of Montenegro

Based on previously conducted research for determining oil and natural gas reserves, total oil core potential has been determined in two separate submarine zones in Montenegro amounting 12.5×10^9 tons. According to submitted data, potential oil reserves amount approx 7 billion barrels, while potential natural gas reserves amount 425 billion m^3. Calculated oil and gas reserves are on the level of geologic reserves (perspective and potential) and have been classified as D_1 and D_2 (recognizing sediment basin where conditions for carbon hydroxide creation could occur). Real commerciality of previous emergence of oil and gas in submarine areas in Montenegro can be determined by constructing new additional wells on suitable structures.

It is estimated that significant production can be realized in this area with the increased research, if commercial bearings are discovered shortly.

7.8.2. Supply of petroleum, petroleum derivatives and mandatory 90-day reserves

System for petroleum supply: Actual dynamics of the further development will definitely depend on the discovery of commercial reserves of petroleum and gas in Montenegro, whose exploitation is not envisaged prior to 2020.

Supply of petroleum derivatives: Scenarios of the increase in the final consumption of petroleum derivatives until 2025 indicate the growth of 40% to 60% compared to the baseline year - 2003. Reduction of the final consumption of petroleum derivatives is envisaged in the industry sector due to the increase of the share of other energy sources (LPG) and reduction of share of industrial boiler rooms. The focus is placed on the terminal in the Port of Bar for the system of supply of petroleum derivatives in the observed period. Road and railroad traffic is used for the further transport.

Mandatory 90-day reserves: Montenegro plans to meet requirements for storage capacities to keep mandatory 90-day reserves of petroleum derivatives in accordance with the Directive 98/93/EC using the final consumption scenarios for derivatives until 2025.

Since there is a possibility as well to use already existing storage capacities in the RoM for keeping operational reserves adequate for 45 days, the recommendation is to have a maximal use of these capacities in order to significantly reduce investments. In that case, remaining required investments in storage capacities would amount only around 1 million EUR. If new capacities need to be built for mandatory 90-day reserves of petroleum derivatives, according to Medium scenario of final energy consumption, required investments would amount around 18,3 million EUR. Therefore the strategy recommends and envisages maximum use of existing storage capacities.

7.9. DEVELOPMENT OF LIQUID PETROL GAS, LIQUID NATURAL GAS, AND NATURAL GAS, SUPPLY SYSTEM

7.9.1. Supply of liquefied petrol gas (LPG)

Total consumption of energy for the need of heating, expressed through LPG consumption, will rise from 99,8 thousand tones in 2003, to possible 227,6 thousand tones in 2025. The share of households' consumption, within total consumption would be 63%, the share of service sector 24%, and the share of industry 13%.

Strategy anticipates the medium scenario for development of LPG market, with connection of 30% of potential consumers.

LPG is foreseen as the predecessor to natural gas in major cities (Podgorica, Nikšić, Cetinje) as well as on the coastline (Tivat, Bar, Budva, area of Kotor, Herceg Novi, Ulcinj). Estimated investments in development of gas infrastructure, after 2010, which will be initially used for distribution of LPG, are circa 47 million €.

7.9.2. Supply of natural liquid gas (NLG)

There is interest of foreign investors for possible construction of terminal for NLG in the coastline of Montenegro, i.e. area in vicinity of port of Bar. There are some opinions that terminal (preliminary capacity defined -at least 5 billion m^3 of NLG on annual level) should be built along with thermal-power plant (combined cycles), output power 1.200 MW. Project would be synchronized with announced construction of submarine transmission connection with Italy (direct current 400 kV) into united developmental project of regional importance. Potential implementation of this Project, along with implementation of other foreseen project, would mean very much, and not just for the development of the energy sector (diversification and improved supply stability), but for the overall economic development of Montenegro.

7.9.3. Natural gas supply

Montenegro still does not have access to international sources of natural gas. If a domestic production does not get developed, there are several possible delivery directions in the future: through the Republic of Serbia, through Albania and across the territory of the Republic of Croatia. In September 2007, ministries of Croatia, Albania and Montenegro, which are in charge of energy sector, have launched an initiative to built Ionian- Adriatic pipeline. Project was estimated to be worth 230 millions EUR, out of which 90 millions EUR would be covered by Albania, 80 millions by Croatia, and 60 millions by Montenegro. It is estimated that construction of he Ionian-Adriatic pipeline would be completed in-between 2011.-2012. Total pipeline length will be approximately 400 km. It is estimated that in the near even Bosnia and Herzegovina will join the Project.

Planned exploration in the Montenegrin seabed will realistically indicate whether there are significant quantities of its own natural gas. In the case of discovery of natural gas, it is logical to expect that the system of natural gas supply in Montenegro will develop much faster than in any other option of the import of energy sources.

Montenegro has low potential of gas consumption, and planned investments in the development of gas network are rather high. Thus preceding the introduction of natural gas, development of the gas network system and consumption using LPG is planned first.

Introduction of the system of use of LPG for hating in tourism will definitely have impact on the extension of the tourism season in Montenegro.

7.10. STRATEGY OF INTRODUCTION OF RENEWABLE ENERGY SOURCES

7.10.1. Potentials of the renewable energy sources (RES)

In period 2000 to 2004, Montenegro was producing circa 59% of the primary energy from the renewable sources, out of which 55% from hydro-energy and 4% from fire wood, what is far above EU average. However, Montenegro still has a lot of unexploited renewable energy sources, which can be exploited if reasonable investments are made.

Small Hydro-Power Plants: In the current plans, gross hydro-energy potential was estimated to 800-1.000 GWh, out of which exploitable potential of small hydro-power plants (SHPP) is 400 GWh. This estimate is given based on quite resolute environmental and special limitations occurring in number of small water currents in Montenegro.

However, for the sake of accuracy it is necessary to say that the methodology of exploitation of water currents does not impact the amount of estimated technically exploitable potential of small SHPP (circa 400 GWh), so in order to get the information on total technically exploitable potential in Montenegro, the potential of SHPP can be simply added to the potential for any of the exploitation options. It should also be mentioned that additional researches are necessary in order to fully assess realistically achievable potential of SHPP.

Wind Energy: There is a good potential for exploitation of wind energy on location along the Adriatic sea, on the mountain Rumija area, between Bar and Skadar Lake, where the average wind speed reaches 6-7 m/s. Other areas are on hills behind Petrovac and on mountains between Herceg Novi and Orahovac. The second interesting area is located in continental area around Nikšić (5,5-6,5 m/s).

Solar Energy: This potential is very important and is comparable with potentials of Greece and Italy. Coastline and central area are the most attractive for exploitation of solar energy because of large number of sunny hours (2.000-2.500 hours/annually).

Biomass and Plant Waste: Annual growth rate of wood mass, as the single most important energy source of the kind is estimated at 2,6 m^3/hectare per year, while the current wood consumption is estimated at 1,03 m^3/hectare per year. Estimated growth rate of wood mass is in-between 850 000 m^3/annually and 1.060 000 m^3/annually. Data on available biomass for the energy use still need to be agreed upon. In direct cooperation with local authorities it is necessary to conduct additional researches for obtaining more reliable data.

Utility Waste: It is estimated that in Montenegro 200.000 up to 250.000 tones of solid waste is being produced, meaning there is possibility to built 3 to 5 incinerators depending on capacities. Potential locations for these facilities are in vicinity of bigger cities (Podgorica and Nikšić).

7.10.2. Strategy of exploitation of renewables

Strategy anticipates the use of renewables at least up to 20% of the total primary energy consumption until 2020-2025.

European Commission, on January 10, 2007, has published document titled: Europe Energy Policy. This document sets very ambitious commitments that should be accomplished by 2020; reaching 10% of the bio-fuels share in the total fuel consumption and even more important reaching 20% of share of renewables in the overall energy balance. This means additional increase of renewables in respect to goal from 2001, when it was foreseen that share of renewables in 2010, should be 12%.

a. **SHPP**: In period up to 2025, it is planned to built several SHPP, total power output 80 MW (2010-20 MW, 2015- 30 MW, 2020- 20 MW and 2025- 10 MW), with approximate production of 250 GWh/annually. Foreseen investments up to 2025, are 120 millions EUR.

b. **Wind-farms**: Since the technical potential on the most attractive locations in Montenegro is estimated to 100 MW, it is necessary to conduct detailed measurements in order to determine micro-locations for potential projects and also to produce the study for development of the wind-farms. With investment costs ranging from 1.000 EUR/kW and expected number of working hours-2.200 annually, the Strategy foresees minimum 60 MW: two wind-farms total capacity 10 MW (2x5 MW) expected to be operational in 2010, 2x3 wind-farms total production capacity 30 MW to be operational in 2015, and 2020, and four wind-farms total capacity 20 MW in 2025. Foreseen investments up to 2025, are 60 millions EUR. In case of expressed interest of the foreign investor, the Strategy allows for greater capacity and faster dynamics, as long as potential problems of introducing the wind-farms into relatively small power system of Montenegro are solved, the problems of reserves of power system solved and as long as there is an economic justification for such projects.

c. **Solar energy**: Large obstacle to more significant use of photovoltaic systems is the high installation cost ranging between 4,000 and 6,000 EUR/kW, while their conversion efficiency is

relatively small. However, having in mind changes in technologies, it is necessary to make detailed analysis on this issue within the Action Plan. Therefore in period until 2025, there are no plans to use solar energy for production of electricity (photovoltaic) that could be transmitted through distributive network, but rather direct use of solar energy for heating, hot water, and other low-temperature processes, mostly in the service sector, including tourism and households. Photovoltaic is foreseen only in relatively small range and in special structures (structures and application for which there is no profitable to built the distributive network).

d. **Biomass**: Even though additional researches are required in order to obtain more reliable data, according to estimations the technical potential is adequate for at least 3 to 5 smaller power plants with specific capacity between 5 and 10 MW. For now, the Strategy anticipates construction of co-generation facilities total capacity 5 MW (2020- 2 MW and 2025- 3 MW) and this is giving opportunity for potential private investors to express their interest. Foreseen investments until 2025, are 7,5 millions EUR.

e. **Energy from waste**: A construction of one such facility of capacity of 10 MW is envisaged until 2025, at the territory of the municipality of Podgorica, investment costs are approximately 3,200 EUR/kW. Planned investments until 2025 are 32 million EUR.

f. **Biogas**: At the moment the Strategy does not envisage introduction of significant biogas facilities until 2025.

g. **Bio-fuels**: Use of bio-fuels in the transport sector may be useful to contribute to the higher level of environmental protection. Use of bio-fuels is envisaged after 2010. In 2025, the consumption of bio-fuels would be approximately 0.68 PJ. According to EU Directives related to bio-fuels (bio-ethanol, bio-diesel) it is recommended that in the EU countries the share of bio-fuel in the overall consumption, at the end of 2005, should be 2%, and by the end of 2010, 5,75%. Given figures are recommendation and new member states can negotiate other figures, which than would be mandatory for them. Based on the aforesaid, it is clear that Montenegro does not have any obligations in regard to bio-fuels directives, but because of environmental needs and desired accession to EU, it is necessary to stimulate the consumption of bio-fuels in all sectors of the consumption.

For the sake of faster introduction of renewables, the Strategy foresees that in 2008, certain programs will be prepared related to exploitation of (new) renewables (wind, solar energy, biomass). In this year, tender for concessions was announced, according to combined DBOT arrangement for the exploration of water currents and construction of small hydro-power plants in Montenegro.

7.11. RESEARCHES IN ENERGY SECTOR

Researches of remaining technically useable hydro potential for use in large and small HPP should continue in the period until 2025, in order to be able to plan their construction with accelerated dynamics after 2025.

Beside the research of hydro potential, in coming years is planned as well continuation and intensification of petroleum and gas explorations of the seabed of Montenegro. Explorations conducted up to now fully justify intensification of efforts for these exploration works.

Furthermore it is necessary that systematic coal explorations are continued as some kind of preparation for further use of this important energy resource.

7.12. DEVELOPMENT OF THE POWER GENERATION SYSTEM

7.12.1. *Electricity consumption prognosis*

According to the **Medium** consumption scenario of electricity, which needs to be supplied at the level of high voltage system, either from local production and/or import, in period 2005 – 2025, it is estimated that annual consumption will grow be **1,22%**, while the average annual increase of peak load in the system is **1,51%.** In details: in 2010, it is estimated to have the consumption of 4.765 GWh and peak load of 818 MW, in 2015, 4.982 GWh and 868 MW, in 2020, 5.372 GWh and 938 MW, and in 2025, 5.791 GWh and

1.016 MW. Corresponding average annual growth rates are: 1.41% (2005 - 2010), 0.9% (2010 - 2015), 1.52% (2015 - 2020) and 1.51% (2020 - 2025).

Given average annual growth rate of consumption reflects extremely high share of energy in the total final consumption (more than 40%), which should be significantly reduced in future, and also we have the high share of Aluminum Plant (KAP) in the overall electricity consumption. Lower growth rates at the beginning of the 20 years period are result of implementation of anticipated rigorous measures regarding energy efficiency (including reduction of losses within electrical networks of big consumers), and substitution of electricity especially for heating purposes. In order to reduce energy intensity in Montenegro, the prognosis of electricity consumption, which is based on Medium scenario of final energy according to the MEDEE/MAED model, is taken as realistic and taken into account when producing any analysis and calculates within Strategy.

Sensitivity Analysis (SA1)

Sensitivity Analysis was produced with a goal to test the consequences of deviations from the Strategy, in terms of prognosis of the electricity consumption (SA1), as well as delays in construction of some key structures aimed at meeting the energy demand S(A2, chapter 7.12.2).

In case Montenegro is delaying with energy efficiency measures and substitution of electric energy, as a result of fast GDP growth at the beginning of the observed period, we can expect greater level of consumption compared to estimated one in the Medium scenario according to the model. Assumed annual growth, in that case, would as follows: 2,0% (2005- 2010), 1,5% (2010 - 2015), 0,8% (2015 - 2020) and 0,62% (2020 - 2025), resulting in average growth of 1,22% in period 2005 – 2025; however, such a consumption growth trend, according to Sensitivity Analysis, has negative impact on electric power balance in Montenegro for period (2005 – 2015). Prognosis, in that case, would be: 5.009 GWh (2010), 5.397 GWh (2015), 5.616 GWh (2020) and again 5.791 GWh (2025) or additional 4.244 GWh needed in period 2007 – 2025.

7.12.2. Scenario of including additional generation capacities into the power system

Based on the results of the optimization of development of new generation units of the power system until 2025, and according to the mentioned scenario, candidates for the construction of hydro-power plants and thermal plants are as follows: HPPs on river Morača (Andrijevo, Raslovići, Milunovići and Zlatica), HPP Komarnica, and thermal plant Pljevlja 2. Regarding renewables, candidates for the construction are small hydro-power plants total capacity 80 MW, wind farms 60 MW, one incinerator for utility waste (10 MW) and cogeneration on biomass total capacity 5 MW – or 155 MW of new capacities from new renewables. This capacity makes almost 20% of total power of all power plants within power system of Montenegro, so there will be a need to take care of the stability of Montenegrin power system in those circumstances.

Out of many combinations that were presented in Baseline studies (book D), the Strategy opts for development of new generation capacities according to **Scenario of „moderate construction"** (Table 5).

Table 5: New power plants according to Scenario of „moderate construction"

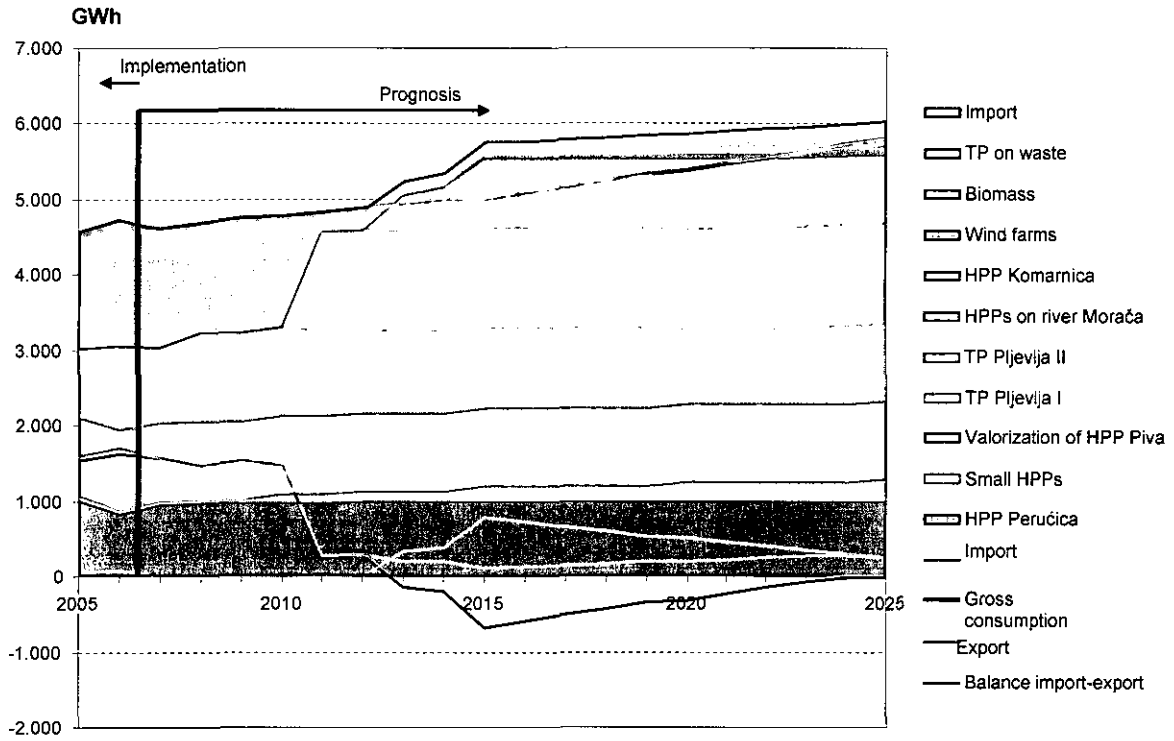
Operational in	New facilities	Power (MW)	Investments (mil.EUR)
2010	Small HPP	20	30,0
	Wind farms	10	10,0
2011	Thermal plant Pljevlja 2	225	175,0
2013	HPP Andrijevo	127,4	194,9
	HPP Zlatica	37	84,7
2014	HPP Raslovići	37	73,5
2015	HPP Komarnica	168	134,1
	HPP Milunovići	37	77,0
	Wind farms	15	15,0
	Small HPP	30	45,0
	Thermal plants on waste	10	32,0
2020	Wind farms	15	15,0
	Small HPP	20	30
	Cogeneration. Biomass	2	3
2025	Wind farms	20	20,0
	Small HPP	10	15,0
	Cogeneration. Biomass	3	4,5
Total		**786,4**	**958,7**

Source: IREET Institute, Ljubljana 2007,

Table 5 shows that, within the Scenario of "modest construction" there is a need to built 786 MW of additional generation capacities within power sector that require additional investments of approximately 960 millions EUR.

Share of investments regarding the construction of hydro-power plants (capacity over 10 MW) is approximately 59% out of total investments needed for the development of power sector, i.e. approximately 560 millions EUR. The share of investments when it comes to construction of thermal facilities is 18% i.e. 175 millions EUR, and the share of investments in renewables is 23%, i.e. 220 millions EUR.

Graphic 3: Structure of sources covering electricity consumption until 2025,



Year	HPPs (without HPP Piva)	TP	Valorization of HPP Piva	Renewables	Import	Export	**Total**
2010	971	1.152	1.065	120	1456	0	**4.765**
2015	1.927	2.369	1.065	296	108	783	**4.982**
2020	1.927	2.290	1.065	406	194	511	**5.372**
2025	1.927	2.325	1.065	485	250	262	**5.791**

Source: Energy institute Hrvoje Požar, IREET Institute: Long-term energy supply plan of Montenegro, Ljubljana 2007

On graphic 3, we showed the structure of sources regarding covering of electricity consumption until 2025. This graphic clearly shows that the import of electricity will be on the increase until the new thermal Plant Pljevlja 2 is built. It is important that alongside anticipated dynamics of construction the import-export balance is negative if observed during entire period. Looking at the graphic it can be concluded that with construction of the first generation facility, the import of electricity will be drastically reduced.

In the table 6, we have shown the structure of the overall domestic production of electricity according to the source of primary fuel (Scenario of "moderate construction"). In the entire planned period 2010-2025, the share of renewables will stay at approximately 60%, while the share of "new" renewables is constantly on the increase and in the final 2025, reaches 8%. Remaining share goes for the thermal plants (TPs Pljevlja 1 and 2) which remains circa 40%.

Table 6: Structure of electricity production in Montenegro (2005-2025)

Year	GWh				%			
	Total renewables	*Just new renewables*	TP Pljevlja I + II	Total (TP+HPP)	Total renewables	*Just new renewables*	TP Pljevlja I + II	Total (TP+HPP)
2005	2,104	*23*	890	2,994	70	*1*	30	100
2010	2,157	*120*	1,152	3,309	65	*4*	35	100
2015	3,288	*296*	2,369	5,657	58	*5*	42	100
2020	3,399	*406*	2,290	5,689	60	*7*	40	100
2025	3,478	*485*	2,325	5,802	60	*8*	40	100

*Note: *) New renewables: small HPPs (<10 MW), wind farms, cogeneration on biomass, TP on waste.*

Sensitivity Analysis (SA2)

Sensitivity Analysis, regarding supply, is focused on the following risk elements within Strategy implementation:

- After the Government of Montenegro withdrew from privatization of the existing TP Pljevlja and selling of government shares in the Coal Mine company Pljevlja, it is necessary to find clear alternatives for investments and rehabilitation of the TP Pljevlja and in particular investments for the construction of the new block of thermal plant -Pljevlja 2, which is supposed to be operational in 2011. "What if the investment in TP Pljevlja 2 is delayed for 2 years, and especially in case of accelerated increase of electricity demand in the starting period *(2005 -2015)* according to *SA1?"*
- Not a single significant electricity generation source was built in Montenegro in the last 30 years. Therefore both Montenegro and potential investors lack experience in solving this particular problem, collecting number of different permits, concessions, adoption of EIA report and similar, all related to the construction of new hydro power-plants. Strategy foresees that first HPP on river Morača could become operational in 2013, but: "*What if the operability of the entire chain of HPPs on river Morača is delayed for 2 years, and especially in case of accelerated increase of electricity demand according to SA1?"*
- In general, the delay in construction of thermal plants and hydro power-plants is common practice even in developed economies, therefore it is justifiable within AO to anticipate even the worst case scenario that thermal plant Pljevlja 2 as well as chain of HPPs on river Morača is delayed each for example for 2 years. "*What is the impact on electricity power balance in Montenegro in this case scenario and in circumstances of accelerated electricity demand, according to the SA1E?"*
- Every SA is analyzing even positive assumptions, for example that the chain of HPPs on river Morača is built even faster than anticipated in the Strategy, for example the first HPP to be built in 2011, or 2 years earlier. "*What kind of positive effect this early construction would have on the electricity power balance in Montenegro, in accordance with Medium scenario of consumption and scenario of accelerated consumption according to the SA1?""*

SA conclusions:

a) Dynamics of electricity consumption, according to the Medium Scenario of the Strategy can be considered as "conservative" in terms of increase of consumption especially in the starting period 2005 - 2015. Changed dynamics indicates the need for additional 4.244 GWh in period 2007 – 2025, which can be provided only from import.

b) In order to achieve the goal of the Medium Scenario of consumption increase it is necessary to start implementing, immediately, rigorous energy efficiency measures, especially in terms of reducing losses on the grid and substitution of electricity with other fuels.

c) If the energy system of Montenegro fails to implement recommendations from the previous point, Montenegrin power system will be in serous problems, coping to cover the energy deficit until the thermal plant Pljevlja and HPPs on river Morača become operational. The situation can get even worse with the delay of this generation units entering the power system. Therefore, it is necessary to introduce all possible measures supporting the implementation of the Strategy within prescribed deadlines. It is necessary to

underline great problems in providing for electricity, bearing in mind the fact that in the entire region there is deficit of electricity supply and production.

d) Possible construction of HPP on the Morača prior than envisaged by the time schedule from the Strategy would in any example of development of electrical energy consumption have positive impact on energy balance as well as on other financial indicators of electro-energetic system.

e) Failure to act in accordance with the time schedule envisaged by the Strategy, with possible rapid growth of consumption would have significant impact on increase of costs for import of electrical energy; reduction of export possibilities, i.e. it would have negative impact on foreign-trade balance of Montenegro in subsequent years.

f) Proposed Strategy (in respect of coverage of projected consumption of electrical energy according to midterm scenario - GDP) has no reservations and does not allow any failure to act in accordance with the time schedule for construction of all new capacities, without significant negative impacts on security of supplying consumers in Montenegro.

7.13. DEVELOPMENT OF POWER TRANSMISSION SYSTEM

Development of the transmission network until 2025 is planned in such a way to enable exchange of electrical energy with neighboring systems, to improve supply of some areas and larger towns of Montenegro and to enable connection of new electrical energy sources and reduction of losses as well.

In the planning period until 2025, transmission network will be reinforced with:

- Installation of the TS 400/100 kV in Ribarevine (Bijelo Polje),
- Resolution of the connection of TS Andrijevica to 110 kV network,
- Construction of the TS 110/35 kV in Kotor and construction of distribution power line 110 kV: Tivat – Kotor – HPP Perućica,
- Construction of 400 kV transmission power line Podgorica – Tirana.
- Resolve the issue of double feeding of the TS 110/35 kV in Ulcinj, either by construction of parallel power line 110 kV to TS 110/35 kV in Bar or the transmission power line 110 kV Ulcinj – Shkoder,
- Resolve a T connection of the TS 220/110 kV Mojkovac to 220 kV network,
- Construct TS 220/110 kV in Grbalj and distribution power line 220 kV HPP Dubrovnik – Grbalj – HPP Perućica,
- Construct new TS 110/x kV, and connect them in an appropriate manner to the 110 kV network (it is necessary to provide for double connection of almost all TS 110/x Kv).

Independently on the scenario of construction of new power plants, it is necessary to connect new TS of 110/35 kV and 110/10 kV (Rožaje, Brezna, Žabljak, Kolašin, Buljarica, Tuzi, Podgorica – Center, Podgorica 5 and Podgorica 6, Bar 2, Virpazar, Nikšić–Bistrica, Nikšić-Kličevo, Golubovci), and construct new power transmission lines 110 kV (Podgorica 1 – Tuzi – Golubovci – Virpazar, Bar – Budva 2, Brezna – Žabljak and other).

Projected capital investments into transmission network until 2025 amount to 199 million EUR.

The presented transmission systems are sufficient for connection of envisaged generation facilities according to the Scenario of "moderate development" of new capacities and envisaged transit of electrical energy.

Since the practice in European countries is to abandon the voltage level of 220 kV and transit to the level of 400 kV, it is necessary to commence with the study as to determine the optimum time period for transition as well as required resources.

Due to possible appearance of bottlenecks, it is necessary to study the need for reinforcement of Montenegrin transmission network (e.g. construction of power transmission line 400 kV Podgorica – Pljevlja) and construction of new 400 kV interconnective power transmission lines between Montenegro and B&H (e.g. Pljevlja – Višegrad or Pljevlja - Buk Bijela) and Montenegro and Serbia.

Particular focus in development of the transmission system and regional interconnection should be directed to possibilities of construction of submarine transmission system to connect Montenegro and Italy. It is necessary to study in details the need for construction of 400 kV submarine cable for interconnection between Italy and Montenegro and relevant transmission infrastructure for the purpose of its connecting with the current 400 kV network. Preliminary considerations indicate the feasibility of the construction of the power transmission line of high voltage (400 kV) direct current between Montenegro and Italy.

7.14. DEVELOPMENT OF POWER DISTRIBUTION SYSTEM

Development of the distribution network until 2025 is planned in such a way to increase the level of the security of supply to some towns and reduce losses of electrical energy to the level of 10%, which is considered to be needed but very optimistic goal of the Strategy. Since the losses already decreased from 25-30% (technical and non-technical losses) to approximately 20% in 2007, additional and accelerated reduction of losses is a very important measure for improvement of technical and economic efficiency of the EPCG (plan for 2008 – 17.5%). High losses in distribution network make the reconstruction of distribution networks in Montenegro become a significant priority in the first Action Plan of the Strategy. EPCG is encouraged to develop and implement short-term and mid-term programs for reduction of losses. Second, equally important, but a short-term goal in this direction is a need to increase the collection rate from the tariff consumers (reduction of non-technical losses).
In the planning period until 2025, following construction is envisaged: 110/35 kV substations, 110/10 (20) kV substations, reconstruction of existing 110/35 kV substations to 110/35 – 10 kV substations, 35/10 (20) kV substation and reconstruction directed to increase the apparent power of existing 35/10 kV substations. Envisaged capital investments into distribution network until 2025 amount to EUR 491million.
Since the practice in European countries is to abandon the voltage level of 35 kV on distribution level and transit to direct transformation 110 kV/20 kV it is necessary to commence with study as to determine the optimum time period for transition as well as required resources.

7.15. TOTAL ENERGY BALANCE UNTIL 2025

Projections of overall energy balance of Montenegro until 2025: Starting from: (a) scenario of development of the construction of the electrical energy system (Scenario of "moderate construction"), (b) scenario of development of final energy consumption (medium scenario) and (c) scenario of development of LPG market (medium scenario), final projection of total energy balance of Montenegro was developed.

Projection of the primary energy consumption: In total energy balance of Montenegro envisaged is significant increase of production of lignite and hydro energy. An increase in production of fuelwood and biomass is expected, but their share in total production of the primary energy will continuously be reduced. Anticipated is the increase of use of solar energy, wind energy, communal waste and industrial wood waste. According to the Strategy, total consumption of primary energy will grow until 2025 with an average annual rate of 2.4% (with the same GDP growth rate of 6.3% and final consumption of 2.5% for all scenarios) in comparison to the base year of 2003, which indicates significant improvement in terms of reduction of the consumption of primary energy per GDP unit.

Projection of the final energy consumption: All scenarios in Expert bases (Paper B) envisage the growth of share of petroleum derivatives to approximately 40%, the increase of the share of heat energy to approximately 12% and reduction of the share of electrical energy to 40%. Reduction of the share of heating wood and biomass is also expected, as well as slight increase of the share of renewable energy sources. The most important part in the consumption of petroleum derivatives will continue to be the one of diesel fuels and motor gasoline. Commencement of use of biodiesel is expected, as well as the increase of use of solar power.

Main indicators of overall energy balance of the RoM until 2025:

- **Generation of primary energy** (Table 7): Total generation of primary energy will be increased to 43.12 PJ in 2025. In that year, coal (64%) and hydro energy (27%) will be the most important forms, and the share of «new» sources of renewable energy will be 9%.

Table 7: Generation of primary energy in the RoM system (PJ)

Year	TOTAL
2010	24,35
2015	42,66
2020	43,04
2025	43,12

Source: IREET Institute, Ljubljana 2007.

- **Balance of import and export of energy** (Table 8): Montenegro will not meet all primary energy needs with its own generation. Total demand for petroleum derivatives will continue to be met from import. Total balance of import in 2025 will be approximately 30 PJ. Electrical energy will also be imported and this import will be 5.2 PJ in 2010 and due to envisaged construction of TPP Pljevlja 2 and commencement of functioning of HPP on the Morača (2013) and HPP Komarnica (2015) in 2015 it will be reduced to 0.4 PJ. The only export would be electrical energy in smaller quantities (2.8 PJ – 0.9 PJ). The last five-year period envisages import of smaller quantities of biodiesel and hydrogen.

Table 8: Balance of import and export in the RoM system (PJ)

Year	IMPORT				EXPORT	BALANCE
	Petroleum derivatives	Electrical energy	Biodiesel and hydrogen	Total	Total *1)*	Total
2010	17,79	5,24	0,00	23,30	0,00	23,30
2015	21,94	0,38	0,00	22,55	2,81	19,74
2020	26,22	0,69	0,10	27,42	1,84	25,58
2025	30,29	0,90	0,20	32,08	0,94	31,14

Source: IREET Institute, Ljubljana 2007.

Note: 1) Electrical energy.

- **Import / export of electrical energy**: According to all scenarios analyzed in Expert bases (Book D), significant quantities of electrical energy (approximately 1.460-1.570 GWh annually) will continue to be imported due to impossibility of construction of any new power plants prior the start of operation of TPP Pljevlja 2 in 2011. In the period from 2012 to 2025, its import will be significantly reduced due to envisaged construction of new generation facilities (Figure 3). According to the Strategy and Scenario of «moderate construction» of additional electrical-energy capacities, Montenegro will become a temporary net exporter of electrical energy in the period from 2013 to 2025 (maximum approximately 670 GWh in 2015). The assumption is that the contract on exchange of the electrical energy with the Republic of Serbia based on the revised valuation of the HPP Piva generation will continue until 2025. Due to further significant import of electrical energy until 2011, Montenegro will, in the overall planning period 2008-2025, remain a net importer of electrical energy (1.350 GWh) in the balance of import and export.
- **Primary energy consumption:** According to Tables 9-10 and Figure 4, total consumption of energy will consist of coal, renewable energy sources (hydro energy and «new» RSE), petroleum derivatives, and to a lesser extent imported electrical energy. During the period 2010-2025 the share of coal will be from 29% to 45%, petroleum derivatives 35% to 41% and renewable energy sources 22% to 24% (which means still more than 20% of EU target until 2020).Total consumption of energy will be increased from 43.90 PJ in 2003 to 74.25 PJ in 2025, or with average annual growth rate of 2.4%.

Table 9: Total consumption of primary electrical energy by forms (PJ)

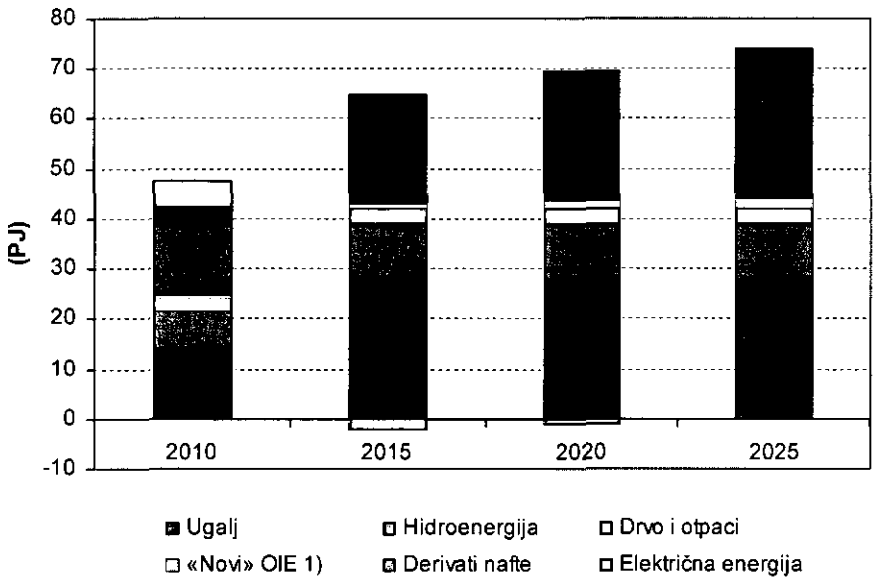
Oblik energije	2010	2015	2020	2025
Ugalj	14.05	27.91	27.76	27.58
Hidroenergija	7.68	11.36	11.6	11.72
Drvo i otpaci	2.44	2.71	2.77	2.69
«Novi» OIE *1)*	0.27	0.9	1.41	2.01
Derivati nafte	17.97	21.94	26.22	30.29
Električna energija	5.24	-2.43	-1.14	-0.04
UKUPNO	**47.65**	**62.39**	**68.62**	**74.25**
Udio OIE	**21.8%**	**24.0%**	**23.0%**	**22.1%**
Energetska nezavisnost	**51.3%**	**68.7%**	**63.5%**	**59.3%**

Note: 1) Including biodiesel, communal waste, solar energy, wind energy and hydrogen.

Table 10: Share of energy form in total consumption of primary energy (%)

Oblik energije	2010	2015	2020	2025
Ugalj	29.49	44.73	40.45	37.14
Hidroenergija	16.12	18.21	16.90	15.78
Drvo i otpaci	5.12	4.34	4.04	3.62
«Novi» OIE *1)*	0.57	1.44	2.05	2.71
Derivati nafte	37.71	35.17	38.21	40.79
Električna energija	11.00	-3.89	-1.66	-0.05
UKUPNO	**100.00**	**100.00**	**100.00**	**100.00**

Figure 4: Total consumption of primary energy by forms (PJ)



Source: IREET Institute, Ljubljana 2007.

- **Introduction of LPG, LNG and natural gas:** Strategy does not envisage the use of LPG for the generation of electrical energy in large TPPs. The possibility for construction of TPP of greater power of approximately 1.200 MW on liquefied natural gas (LNG)[5] and a terminal in the vicinity of the Port of Bar was recognized. Depending on the scenario of the GDP growth

[5] NPG consumption in case of such TPP is not included in energy balance in the Strategy.

and the level of LPG penetration, the LPG will be used as a vanguard to the natural gas in cogenerations in industry, i.e. small cogenerations in service sector and households. The construction of Ionic-Adriatic gas line through the territory of Montenegro would give the option for faster use of natural gas in Montenegro. Natural gas would substitute petroleum derivatives and electrical energy used for heating purposes and would cover additional demand for this energy in towns with developed gas network. Detailed level of substitution and demand for natural gas will be determined when the possibility of Montenegro to dispose with natural gas becomes clearer (revised Strategy in about 5 years).

- **Introduction of remote heating system**: It is envisaged in the town of Pljevlja along with identified additional locations in Montenegro.
- **Level of own supply**: Ratio of own primary energy generation and total primary energy consumption in energy system represents the indicator of "own supply" of the country. The level of own supply of 53.9% in 2006, will be increased according to the Strategy to 68.7% in 2015 (due to increase of own generation of electrical energy) and then it will be reduced to 59.3% in 2025. due to rapid growth of import of petroleum derivatives (Table 9). The level of own supply after 2020 could significantly increase if commercially exploitable sources of crude oil and natural gas are found in Montenegrin coastal area.

Table 11 provides for some main indicators of energy sector of Montenegro until 2025 in comparison with the base year (2003):

- Gross domestic product - GDP (mil. EUR)
- Gross domestic product per capita (EUR/cap)
- Total primary energy consumption – TPEC (PJ)
- Total final energy consumption - TFEC (PJ)
- Total electrical energy consumption (GWh)
- Intensity of primary energy - TPEC/GDP (MJ/EUR)
- Intensity of final energy - TFEC/GDP (MJ/EUR)
- Electrical energy consumption per capita (kWh/per capita)
- Efficiency of energy conversion - TFEC/TPEC) (%)
- Share of electrical energy generated by «new» RSE (%)
- Share of electrical energy generated by RSE (%)
- Emission CO_2 (thousand tons)
- Intensity od carbon dioxide- CO_2/GDP (ton/mil EUR)

The Strategy envisages that in the period to 2025 GDP will increase by almost four times. However, intensity of use of primary energy (TPEC/GDP) will be reduced by approximately 60%. The electrical energy consumption per capita will be increased by over 30%. The envisaged development of energy sector will also improve the efficiency of energy transformation (final energy/primary energy) from the current level of 64% to 68% in 2025 (lower level in 2015 due to introduction of TPP Pljevlja 2). Due to very intensive introduction of renewable sources the intensity of carbon dioxide (CO_2/BDP) will also be reduced by almost a half in 2025. The Strategy envisages significant qualitative improvements in respect of efficiency in using energy and reduction of impact of electrical energy sector on global heating.

Table 11: Main indicators of development of energy sector of Montenegro

	2003	2010	2015	2020	2025
Gross domestic product - GDP (mil EUR)	1,433	2,160	3,061	4,242	5,504
Index to 2003	100	150.7	213.6	296.0	384.1
Annual growth (%)		*6.04*	*7.22*	*6.74*	*5.35*
Average annual growth during 2003-2005 (%)			*6.31*		
Gross domestic product per capita (EUR/cap)	2,260	3,375	4,724	6,496	8,377
Index to 2003	100	149.3	209.0	287.4	370.6
Annual growth (%)		*5.89*	*6.96*	*6.58*	*5.22*
Average annual growth during 2003-2005 (%)			*6.14*		
Total primary energy consumption - TPEC (PJ)	43.9	47.65	62.4	68.6	74.3
Index to 2003	100	108.5	142.1	156.3	169.2
Annual growth (%)		*1.18*	*5.54*	*1.91*	*1.61*
Average annual growth during 2003-2005 (%)			*2.42*		
Total final energy consumption – TFEC (PJ)	29.8	35.6	40.6	46.3	51.6
Index to 2003	100	119.5	136.2	155.4	173.2
Annual growth (%)		*2.57*	*2.66*	*2.66*	*2.19*
Average annual growth during 2003-2005 (%)			*2.53*		
Total electrical energy consumption (GWh)	4,393	4,811	5,049	5,508	6,045
Index to 2003	100	109.5	114.9	125.4	137.6
Annual growth (%)		*1.31*	*0.97*	*1.76*	*1.88*
Average annual growth during 2003-2005 (%)			*1.46*		
Intensity of primary energy - TPEC/GDP (MJ/EUR)	30.6	22.1	20.4	16.2	13.5
Index to 2003	100	72.0	66.5	52.8	44.1
Annual growth (%)		*-4.58*	*-1.57*	*-4.53*	*-3.55*
Average annual growth during 2003-2005 (%)			*-3.66*		
Intensity of final energy - TFEC/GDP (MJ/EUR)	20.8	16.5	13.3	10.9	9.4
Index to 2003	100	79.3	63.8	52.5	45.1
Annual growth (%)		*-3.27*	*-4.25*	*-3.82*	*-3.00*
Average annual growth during 2003-2005 (%)			*-3.56*		
Electrical energy consumption per capita (kWh/cap)	6,929	7,517	7,792	8,435	9,201
Index to 2003	100	108.5	112.4	121.7	132.8
Annual growth (%)		*1.17*	*0.72*	*1.60*	*1.75*
Average annual growth during 2003-2005 (%)			*1.30*		
Efficiency of energy conversion - TFEC/TPEC (%)	67.9	74.7	65.1	67.5	69.4
Index to 2003	100	110.1	95.8	99.4	102.3
Annual growth (%)		*1.38*	*-2.73*	*0.74*	*0.57*
Average annual growth during 2003-2005 (%)			*0.10*		
Share of electrical energy generated by «new» RSE (%)	0.5	3.6	5.2	7.1	8.4
Index to 2003	100	726.0	1,046.0	1,428.0	1,670.0
Annual growth (%)		*32.74*	*7.58*	*6.42*	*3.18*
Average annual growth during 2003-2005 (%)			*13.65*		
Share of electrical energy generated by RSE (%)	47.2	65.2	58.1	59.8	59.9
Index to 2003	100	138.1	123.2	126.6	127.0
Annual growth (%)		*4.72*	*-2.26*	*0.55*	*0.06*
Average annual growth during 2003-2005 (%)			*1.09*		
Emissions CO2 (thousand tons) *2)*	1,366	1,474	2,926	2,824	2,869
Index to 2003	100	107.9	214.2	206.7	210.0
Annual growth (%)		*1.09*	*14.70*	*-0.71*	*0.32*
Average annual growth during 2003-2005 (%)			*3.43*		
Intensity of carbon-dioxide - CO2/GDP (ton/mil EUR) *2)*	953	682	956	666	521
Index to 2003	100	71.6	100.3	69.8	54.7
Annual growth (%)		*-4.66*	*6.97*	*-6.98*	*-4.77*
Average annual growth during 2003-2005 (%)			*-2.71*		
Share of RSE in primary energy consumption (%)	25	22	24	23	22
Index to 2003	100	87.6	96.4	92.4	88.8
Annual growth (%)		*-1.88*	*1.93*	*-0.85*	*-0.78*
Average annual growth during 2003-2005 (%)			*-0.54*		
Own supply (%)	54	51	69	63	59
Index to 2003	100	95.0	127.3	117.5	109.7
Annual growth (%)		*-0.73*	*6.03*	*-1.59*	*-1.36*
Average annual growth during 2003-2005 (%)			*0.42*		

Source: IREET Institute, Ljubljana 2007.

Note: 1) Base year, 2010-2025 according to estimates by MEDEE/MAED
2) Emissions only from thermal power plant.

7.16. ASSESSMENT OF MACROECONOMIC EFFECTS OF ELECTRICAL ENERGY GENERATION IN MONTENEGRO

According to the results of the «Analysis of assessment of effects of electrical energy generation in Montenegro on basic macroeconomic aggregates» (Institute for Strategic Studies and Projections), the increase of capacities in domestic elecrical energy facilities that would enable the increase of the scope of electrical energy generation in Montenegro, i.e. substitution of import of electrical energy with domestic generation, has multiple positive effects on the economy of Montenegro.

The Analysis of effects of the change of generation of electrical energy on GDP indicates that in 2006 one additionally generated gigawatthour (GWh) of electrical energy only based on increase of generation would lead to increase of the value of GDP by 33.300 EUR. However, if the generation of this GWh of electrical energy would lead to reduction of import by the same amount, total increase of the value of GDP would amount to 77.800 EUR (price of imported electrical energy in 2006 amounted to 44.5 EUR/MWh). For example, if Montenegro would generate on its own all electrical energy requried for substitution of import in 2006, total increase of GDP in that year would amount over 133 milijon EUR or 7.5% GDP (GDP in 2006 – 1.778 million EUR).

The effect of increase of own supply of electrical energy on employment and the budget is also positive. In case of the paragraph mentioned above, the employment would increase by 0.3% and budget revenues by 4.9%.

In case of the substitution of import of electrical energy with domestic generaiton, the value of increase of GDP would increase with the increase of price of imported electrical energy. According to preliminary data the price of 1 GWh of imported electrical energy in 2007 was higher by about 45% than the price in 2006. Therefore, the increase of the generation of electrical energy by 1 GWh in 2007 would lead to increase of GDP by 99.800 EUR, while retaining the price of domestic generation of electrical energy at the same level. That is, the effect of increase of generation of electrical energy and reduction of import of electrical energy by 1 GWh in 2007 would have by 30% higher effect on increase of realized GDP than in 2006.

In the circumstances when high prices of imported electrical energy are expected in the midterm period, it is necessary to point out the positive significance of increase of domestic generation of electrical energy in Montenegro.

The Analysis is related only to calculation of direct effects of increase of electrical energy generation. Given that indirect effects (impact on other branches of economy and additional macroeconomic indicators, eg.: foreign-trade balance, inflation and the like) are not quantified, it is realistic to assume that overall positive effect on GDP and employment and the budget would be higher than the assessed.

The effects of the construction of energy power plants that are reflected in strong work incentives (development of activities related to construction and maintenance of electro-energetic systems; revenues during the construciton, development of supporting infrastructure etc), fully support the option defined in the energy policy of Montenegro and this Strategy, which means the reduction of import and the use of domestic natural energy resources for generation of electrical energy.

It may be concluded that the analysis of macroeconomic effects confirms the justifyability of investments in own generation capacities in Montenegro as a superior alternative to import of electrical energy.

8. ENVIRONMENTAL PROTECTION

Implementation of the Strategy is essentially linked with processes of environmental protection in all phases of project implementation (preparation, design, implementation and exploitation). Active participation of stakeholders is envisaged, both in the process of preparation of projects for realization (studies, permits, UNESCO approval, etc) and in the process of construction of energy facilities.

Substantially, environmental protection is the process of management of natural and men created resources, which is exactly identical with the development of the energy sector. The Strategy is based on requirements of integral development and to a great extent it supports the concept of Montenegro as an ecological state, while respecting the necessity for economic and other development aspects.

Strategy is not a permit for immediate construction and in that aspect the importance of detailed assessment of impact on environment is particularly significant in the process of project approvals. The analysis of development scenarios considered were the possible effects of global warming (*Climate Change*), which was estimated as one of critical aspects in this process. Having in mind the significance and effects of global warming in Montenegro, the development of a separate strategy within the Action Plan was recommended.

8.1. ANALYSIS OF ENERGY DEVELOPMENT SCENARIOS FROM THE ENVIRONMENTAL PROTECTION ASPECT

Impact of EES on environment is observed in the Strategy through the prism of emission of pollutants in the environment, which are result of burning of fossil fuels in TPPs in the process of transformation of the heat energy content of fuels into the electrical energy. Substances released as a result of processes in TPPs essentially have negative impact on the environment in two ways:

- Damaging air quality (emission of SO2, NOx, particulate matter (PM), CO, mercury ...),
- Damaging global Earth climate as a result of greenhouse effect (emission of CO2, CH4, N2O...)..

In case of construction of new HPPs and related accumulation lakes, it is necessary to develop detailed studies of impact of hydro energy on the environment, space and natural resources, in terms of environmental impact. Particular researches are required for multi-purpose possibilities to use hydro potentials in order to provide supply of drinking water, development of tourism and pisciculture, irrigation of agriculture land, etc, having in mind the UNESCO declaration on the protection of the Tara River, and other domestic and international guidelines.

In considering the effects of construction of new hydro-energy facilities (regardless their size) it is necessary not only to consider possible damaging effects, but also positive effects which are present in such cases (recommendation is related to aspects of environmental protection, as well as on social, economic and other effects).

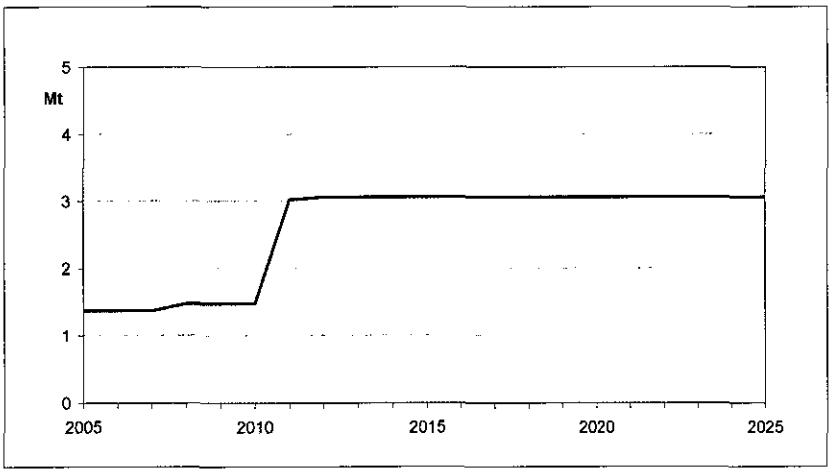
8.2. EMISSION OF POLUTANTS OF ELECTRO ENERGETIC FACILITIES

In calculating emissions released into the environment certain values of emission factors have been assumed for existing and for future potential TPPs, for following four pollutants: carbon dioxide (CO2), sulphur dioxide (SO2), nitrogen oxide (NOx) and particulate matter.

CO_2 emission: Emission of CO2 mostly follows the dynamics of electrical energy generation in TPPs; in this respect the start of the operation of the 2nd block of the TPP Pljevlja in 2011 could be clearly noticed. Commencement of the operation of the TPP Pljevlja 2 will increase annual emission from the EES to the level of 2.9 million tons. It should be noted that the orientation to use of hydro energy potentials, the CO_2 problem will be resolved in indirect manner, since the generation of revenue would be realized through the form of activities that do not generate additional quantities of CO_2. In other words, the

proposed Strategy represents an active contribution of Montenegro to efforts made in the world and Europe in resolving the problem of the greenhouse (Figure 5).

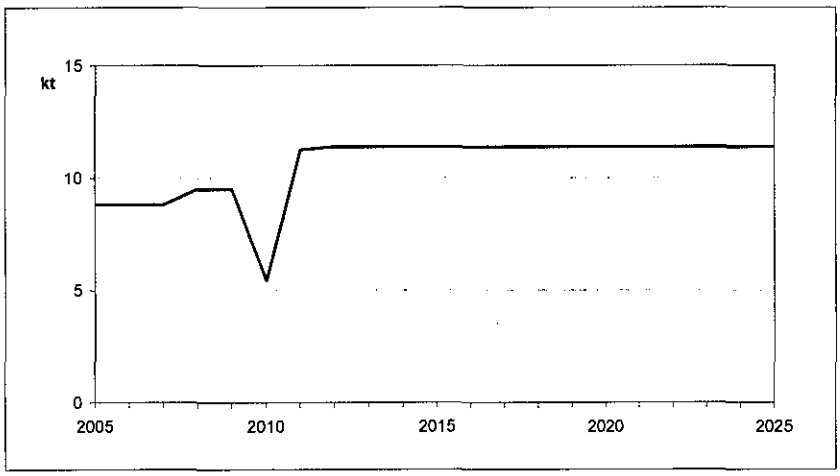
FIGURE 5: Emission CO_2



Source: Energy Institute Hrvoje Požar, IREET Institute: Plan for development of electrical energy system of the Republic of Montenegro

SO2 Emission: In case of SO2 emission a sharp drop could be noticed in 2010, due to the assumption that the system for desulfurization will be installed in the existing block of TPP Pljevlja. After that an additional increase of emission will take place as a result of start of operation of the second block at the same location in 2011, after which expected annual level of SO2 emissions is at 10.7 thousand tons. (Figure 6).

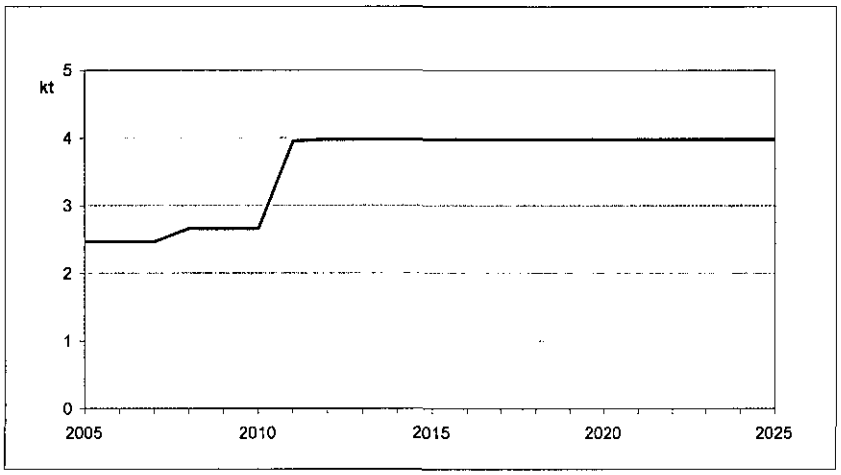
FIGURE 6: Emission SO_2



Source: Energy Institute Hrvoje Požar, IREET Institute: Plan for development of electrical energy system of the Republic of Montenegro

Nox Emission: In case of NOx emissions similar trend could be noticed as in the case of emission of CO2, with increases in those years in which new TPPs start to operate. Construction of TPP Pljevlja 2 increases the emission of NOx to approximately 3.7 thousand tons annually. (Figure 7).

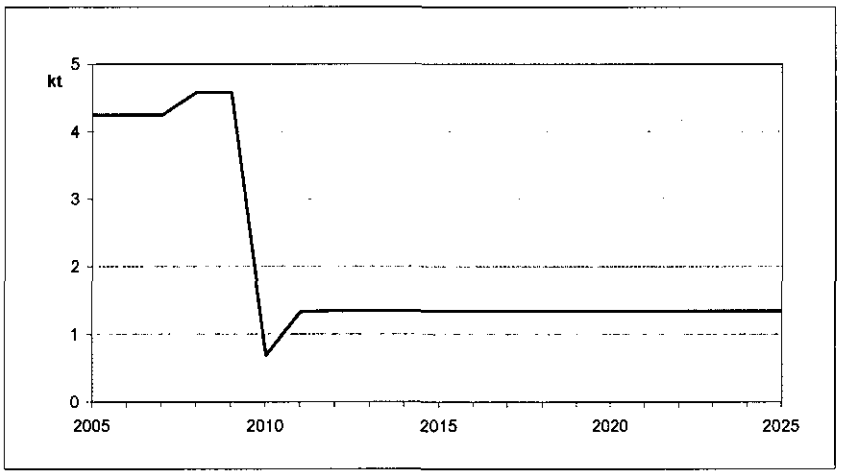
FIGURE 7: Emission NO_X



Source: Energetic Institute Hrvoje Požar, IREET Institute: Plan for Development of Electrical Energetic System of the Republic of Montenegro

Particulate matter emission: In case of emission of particulate matter, a trend of significant reduction is visible, as a result of installation of equipment in the existing facilities of TPP Pljevlja for reduction of emission and construction of new facilities in accordance with EU Directives requirements. In line with those assumptions, emission of particulate matter from the Block 1 records a drastic drop from the level of 4.6 thousand tons in 2009, to the level of 1.3 thousand tons. (Figure 8).

FIGURE 8: Particulate matter emission



Source: Energetic Institute Hrvoje Požar, IREET Institute: Plan for Development of Electrical Energetic System of the Republic of Montenegro

8.3. ENERGY INFRASTRUCTURE AND SPATIAL PLANNING

Energy infrastructure requires space for its development. RoM does not have high population density, has rich and preserved cultural heritage, various habitats and a number of areas of intact nature.

Republic of Montenegro will most likely in the future become a part of the strategic network of trans- European energy networks, as defined in the European Commission Decision 1254/96/EC. Trans-European energy networks are used for increase of energy exchange among EU member countries and for removal of barriers. In the area of electrical energy supply cross border connections for trading options are in the range of about 7% of generation capacities of an individual country. The goal of the EU community is for community countries to establish interconnection capacities at the average of minimum 10%.

Similar directions apply for gas supply networks as well. Republic of Montenegro intends to be involved in future in realization of European energy network projects (e.g. Ionic-Adriatic gas line) which routes should cross its territory.

The process of finalization of the Spatial Plan and Strategy for development of energy sector should be synchronized and conditions should be provided for developmental options in accordance with optimum and ecologically acceptable conditions for use of space.

9. INVESTMENT PROMOTION, COSTS AND FINANCING OF THE ENERGY STRATEGY

Energy sector is one of the most interesting for foreign investors, if we have in mind the period until 2009, when a full liberalization of the energy market of Europe is envisaged. In the area of construction of the energy sector of Montenegro, significant inflow of direct investments is expected in the stated period, which will be caused to the great extent by the adoption and full implementation of the Strategy. The basic precondition for further development of EPCG is the realization of investments that may be provided for by: various levels of privatization, private-public partnership, investments by owners.

9.1. WHAT DIFFERENTIATES THE ENERGY SECTOR OF MONTENEGRO FROM THE NEIGHBORHOOD?

When energy potentials of Montenegro are analyzed in comparison with regional trends, following country advantages could be derived from SWOT analyzes:

- There is a large potential and possibility for use of renewable energy sources, particularly of the hydro energy
- Montenegro is on the strategically important routes for construction of energy corridors towards Croatia, Serbia, B&H, Italy and Albania
- Privatization process in the energy sector in various forms is already analyzed
- Relatively high level of own knowledge exists
- Significant interest of international donors and investors for development of the energy sector as well as of the national economy (tourism for example)
- Possibility for fast creation of the energy information base as a result of relatively small system
- Resources are in the State with relatively small and highly open and flexible economic system

9.2. INVESTMENTS IN THE ENERGY SECTOR OF MONTENEGRO AND COMPARATIVE ANALYSIS

Region of South-East Europe (SEE) represents one of the most competitive locations for attracting foreign investments, primarily due to significant changes in investment policies of these countries. Comparison of the investment environment of Montenegro with the SEE region is based on three basic elements that are determining future investor decisions:

- **Standard (general) operation risks:** Montenegro has very good indicators of investment quality in terms of standard risks taken into consideration by investors in course of deciding on investments, considering political, macroeconomic and financial stability. According to the annual economic freedom report of the Frasier Institute for 2005, Montenegro's grade was 6.0 and it is classified within 86 countries of the World, while in 2006 this growth of 25% was the highest in the region.
- **Achieved level of legislative reforms (achieved fiscal, regulatory and financial incentives for attracting investments):** Montenegro is very competitive from the point of view of achieved legislative reforms and fiscal incentives: it has lowest corporate profit tax rate in Europe of 9% and a number of laws harmonized with EU standards was adopted.
- **Level of basic operating costs (costs of labor, energy and other):** Significant education level of the labor force compared to countries in the region represents a strategic advantage of Montenegro. Taking into consideration overall operating costs in the region, Montenegro has relatively expensive labor force compared with the countries in the region. However, Montenegro's labor market is competitive from the education standpoint, while it could be assumed that the high unemployment level will keep the labor force costs competitive for a longer period.

9.3. INVESTMENT PROMOTION AND CAPITAL MARKET

As a result of increased openness of the neighboring countries, competition will be very hard, and the fight for quality investors inevitable. Therefore, in accordance with this Strategy it is necessary to develop appropriate goal-oriented Program of Promotion of the Energy Sector of Montenegro to attract investments, in order to provide incentives for direct domestic and foreign investments, and to develop Action plan of realization of planned activities with clearly set promotion goals and systematic project approach, which includes all available human resources and adequate financial resources.

Strategic and clear concept of promotion of investments in the energy sector of Montenegro should be based on two main activities:

- **Promotion of Montenegro's advantages as a location for foreign direct investments in the energy sector**. Promotion goals should be set in the process of image creation based on the identified perception of potential investors. Main promotion messages, having a purpose to achieve goals, must take into account specific competitive advantages of the energy sector of Montenegro (potentials of renewable sources and hydro energy, destination on strategic routes of energy corridors, fast and efficient possibility of construction and other). Selection of suitable future energy promotion program and activities of advertising have to be harmonized with other activities of the State that relate to the attraction of foreign investors.
- **Ensuring direct investments through immediate promotion.** Immediate promotion is the best way to establish connections with new potential investors, as this represents a direct access adjusted to the very investor. Therefore, beside harmony of characteristics of the energy sector of Montenegro as a destination with investor's needs and expectations, final decision therewith may be influenced to the great extent by an active professional role of the promoter of investments in the pre-investment period (informing, setting contacts and providing professional services to foreign investors, and establishing connections among investors and other institutions in the State), during the investment process (permits and approvals of competent bodies, infrastructure, locations) and in the post-investment period (business communication and keeping links with existing investors, efficient resolution of problems that appear with every new investment and assistance with new investments).

Increase of inflow of direct investments (foreign and domestic) in the energy sector of Montenegro is one of the main goals of the Strategy. In this respect, this strategic document can influence the real inflow of investments, only to a certain limit. Strategy cannot directly influence certain factors which are also important in the investment process, that is, it can realistically impact some of them but only in a long run.

In consideration of recommendations and potential investment projects given in this Strategy, it is necessary to bear in mind that the time factor is of key importance, since in a specific way potential projects in Montenegro are in active competition with similar projects from the neighborhood. Therefore, it will be necessary immediately after the adoption of the Strategy to define action options and implement the commitments given in this Strategy.

9.4. FINANCIAL RESOURCES REQUIRED FOR THE DEVELOPMENT OF THE ENERGY SECTOR

Developed and documented analyses in the Strategy clearly indicate that significant resources are needed for the implementation of the Strategy. The following Table 12 gives a summary of funds needed for the development of the energy sector.

Table 12: Funds needed for realization of scenarios of overall energy balance (S)

NAME	mil. EUR
ELECTRICAL ENERGY SECTOR AND REMOTE HEATING	
Coal Mine Pljevlja *1)*	79
Central heating in Pljevlja	20
New TPP (Pljevlja 2)	175
Investments in new HPPs (> 10 MW)	565
Investment in «new» renewable energy sources	
Investments in small HPPs	120
Investments in wind PPs	60
Investments in waste fired TPP	32
Investments in cogeneration on biomass	7,5
Rehabilitation of existing power plants	
Rehabilitation of TPP Pljevlja 1	43
Rehabilitation of HPP Piva	70
Rehabilitation of HPP Perućica	49
Rehabilitation of small HPP	4
Investments in electrical energy network	
Investments in transmission network	199
Investments in distribution network	491
GAS AND LIQUID FUEL SECTOR *2)*	
Liquified petroleum gas LPG *3)*	47
Investments in additional storage capacities for mandatory 90-day reserves of petroleum derivatives *4)*	1
TOTAL INVESTMENTS	**1.963**

Source: IREET Institute Ljubljana 2007. 081652579

Note:

1) Financial resources are required for rehabilitation and reconstruction of existing facilities, since without stabilization of the current generation until 2011 the supply of coal to TPP Pljevlja 2 will not be possible; the resources do not include the funds for expanded investments, which is in function of increasing generation for the purpose of providing necessary quantities of coal for TPP Pljevlja and they do not include the funds required for realization of the social program for the purpose of achieving productivity at the level of the average of a mine with similar technology in Europe and other funds required for realization of the strategy for restructuring Coal Mine A.D. Pljevlja, or investment funds required for technical and economic valuation of other mineral raw materials (marl for production of cement). The amount of capital investments for increase of coal production to necessary quantities for supply of block 2 TPP Pljevlja will be defined in technical-economic documentation of investment project.

2) It does not include necessary investments and costs of planned researches in Montenegrin sub-marine area by (private) concessionaires or investments for construction of gas infrastructure (transmission and main gas lines, e.g. 60 mil. EUR for Montenegrin section of Ionic-Adriatic gas line).

3) It includes investments in gas infrastructure (network, evaporators, containers) in towns with high potential for introduction of natural gas in future, and where LPG is it's vanguard (e.g. Podgorica, Nikšič and Montenegrin Coast), according to Medium Scenario of introduction of LPG until 2025..

4) In case of maximum use of existing capacities for 45-day reserves and assumptions that no additional investments are needed for existing capacities being technically functional.

As already mentioned (subsection 7.9.3) in case of realization of the project Ionic-Adriatic gas line, it is necessary to envisage funds in the amount of approximately 60 mil EUR that Montenegro would invest as its share in accordance with the signed ministerial declaration. In addition, other investments being announced will be the subject of consideration in the Action Plan.

9.5. ROLE OF STATE, PRIVATE SECTOR AND FINANCING SOURCES OF ANTICIPATED DEVELOPMENT OF ENERGY SECTOR

The data from Table 12 of anticipated investment projects (approximately 2 billion EUR, meaning the value of annual GDP) provide the base for viewing total volume of investment needs, as well as specific base for decision making on the share of state capital in the process of energy sector development.

Since the State has no possibility to finance the whole range of envisaged investments, the Strategy envisages that the state undertakes the following roles: (1) **energy policy**, (2) **regulation of the sector** and (3) **ownership over strategically significant energy infrastructure.** Also, the state is to simplify all legal and administrative procedures for the purpose of efficient realization of envisaged projects.

The Strategy therefore assumes that the State will through its legislation and secondary regulations contribute to faster entering of private capital into energy sector. Private sector would undertake the following roles: (1) **financing services**, (2) **future investor**, (3) **owner of other energy infrastructure**, (4) **manager of specific systems** or the combination of the two last mentioned.

Decisions on the share of state capital are also related to real interests of foreign investors, which actually emphasizes **market-oriented approach** in this Strategy.

Required financial resources for implementation of energy sector development of the RoM may be provided by:

- Using financial potential of existing power plants ("access to capital") for financing construction of new generation capacities of electrical energy;
- Active development of the concept and conditions for use of the PPP (Public-Private Partnership) scenario;
- Investments of energy undertaking with the assistance of financial institutions;
- Privatization of the part of the energy sector, and thus investment of capital in development of the energy sector;
- IPP (Independent Power Producer), concessions and BOT models;
- Use of financing technology of Public and Municipal Bonds;
- Attracting private investments in the energy development and energy projects;
- Development of alternative project financing methods ("Third Party Financing", etc);
- Direct state investments (with the assistance of development banks) in projects of highest priority and with relatively lower investment return rate;
- Issuing state bonds for some projects, considering that future energy investments do not have risky character;
- Credit lines from international financial institutions
- Provision of funds through additional capitalization and by listing the companies in the relevant stock exchange, and
- Other financial approaches in line with positive practice in this area in the World and in the neighboring countries.

10. OTHER STRATEGY ELEMENTS

10.1. PROBLEMS RELATED TO RESTRUCTURING OF ELECTRO-ENERGETIC SECTOR OF MONTENEGRO

In accordance with EU Directives and the law on Energy it is necessary primarily to enable realistic prices of energy. Restructuring of energy sector is very desirable as to achieve optimization, i.e. economic efficiency of specific entities in the system.

Problems related to privatization of energy sector

The basic problems that energy entities encounter with are as follows: weak financial position, high costs, inadequate organization, significant losses, relatively low productivity. The resolution of the mentioned problems in the energy sector is possible through necessary investing in all key segments, including organizational restructuring, optimization of generation processes, amortization of debts and rehabilitation of negative ecological effects.

Since it is necessary to provide for significant financial resources required for improvement of the system and introduction of new technologies, change of ownership structure is one of the models for further development of undertakings in energy sector.

Primarily, it is necessary to commence with privatization of those parts of energy entities that deal with secondary activities. Also, the Strategy recognized the following models:

- additional capitalization
- issuance of concessions
- private public partnership
- privatization of specific parts of EPCG
- sale of controlling or minority package of shares
- etc.

In European practice there already are specific experiences with regard to privatization of largest hydroenergy facilities, which point out the necessecity for this process to be realized in phases.

10.2. ELECTRICAL ENERGY PRICES AND POVERTY REDUCTION

National distortion of prices of electric power (prices of other energy products are largely market-based) has a considerable impact on unfavorable trends in the energy sector and represents a rather extorted solution in the circumstances of low living standard of citizens. Changes in oil prices on the global market will affect the level of inflation in Montenegro. The Strategy initiates an active program of decisions by the energy regulator concerning gradual increase of tariff prices in order to get them closer to the market prices, but it also states that this process needs to take into account socially vulnerable population categories, which essentially is not only the matter of energy sector but also of the activities and measures of the ministry in charge of social protection of the vulnerable population, so that all consumers can be able to pay real market price of the energy they consume.

The Ministry of Health, Labor and Social Welfare, in cooperation with the Ministry for Economic Development, Montenegro Electric Power Company and Regulatory Agency for Energy, and with a view to protecting the interests of consumers-buyers with respect to their ability to pay electrical energy bills, and following the commitment that tariff and price policy for energy should be market-based, prepared the Program for subsidizing the most socially vulnerable groups of citizens aimed at satisfying minimum needs for electric and heating energy that was adopted by the Government in July 2007. The Strategy envisages the improvement of this Program in accordance with the development of energy market in future.

The Strategy for development and reduction of poverty in Montenegro will be reviewed and adjusted with other strategic documents, primarily with the Strategy and the Strategy for Energy Efficiency. What is important here is that specific Action Plans should also be focused on specific measures as to truly achieve results in this area.

In October 2007, Montenegro signed a Memorandum on Social Aspects in the Context of the Agreement on Energy Community. The Memorandum recognizes high significance of the social dimension, points out the principles and the context for social dialogue in energy sector on national and regional level.

10.3. DEVELOPMENT OF ENERGY SECTOR AND SOCIAL POSITION OF CITIZENS

The development and overall activity of energy sector is repeatedly and indivisibly connected with the social position of the citizens of Montenegro. Besides direct impact through energy prices (the orientation for gradual elimination of electrical energy prices distortion is evident), the social position is influenced by the possibility of employment, entrepreneurship (founding of companies that would focus their activities to the functioning of electrical industry in all stages of building and exploitation), additional education (post graduate and university education), the modernization of technological level of labor structure in Montenegro as well as overall quality of life through the achievement of policy of secure energy supply and enabling the choice of energy sources and their suppliers.

The significant funds are entering the economy of Montenegro during the construction of facilities for development of energy sector, which enables both increase in households' income and development of certain structures (it is known that the construction of hydro power plants encourages the development of over 40 industries related to the construction of these facilities). The creation of building working group and staff capacity during the construction of hydro energy facilities results also in creation of conditions for intensified realization of complementary projects (building of accumulations, road network, irrigation systems, sewerage systems, and the like) so that it represents a long term effect which has significant social consequences.

Investing in the development of the energy sector contains another very important component which materially impacts the social position of the citizens and it reflects in the fact that the space for "black capital" and so called "grey economy" is narrowed through these investments since the majority of funds are directed through regular capital flows thereby eliminating appearances that has harmful impact on the social position of the citizens.

10.4. INDICATORS OF BENEFITS OF THE ENERGY SECTOR DEVELOPMENT FOR CITIZENS OF MONTENEGRO

Empirical data mentioned in such analyses can be unreliable, because a lot of time has passed since electro-energetic facilities were built in Montenegro (similar occurred in the neighboring countries). In the meantime, the energy area experiences series of very dynamic changes. However, the following effects of the electro-energetic system development can be certainly mentioned:

- A significant inflow of investments, which would open new job positions, enable development of new profiles of professional staff and provide strong development incentive to overall economy due to significant inflow of funds;
- Besides the fact that modern technologies of the electrical energy generation employ relatively small number of people, the maintenance of electro-energetic systems represent an excellent opportunity for employment of staff that gained their experience during the construction of facilities.
- Specific synergy effect would be also achieved through the anticipated building: citizens would be able to pay electrical energy price through the increased salary, and after the completion of building, the economic effects of electrical energy generation would be partly distributed to the economy, which would also have impact on individual households.
- Building of hydro energy sources represents special protection of consumers in Montenegro from unpredictable movements at energy market.
- The application of model of financing of the construction of energy facilities would leave the possibility of investing funds by citizens with corresponding guarantees in the form of electrical energy vouchers (so called *Municipal Bonds*)
- A whole series of positive effects on microclimate, the possibility of new economic activities (river and lake tourism, growing of aqua cultures, and the like), improvement of the quality of living and provision of vital demand – water.

In any case, the Strategy includes (in the process of implementation of specific projects) the development of appropriate evaluations of impacts and expanded public discussion before the specific decision on building is adopted. Based on the former insights in these problems, perceived needs and consequences justify the location and possible building of such facilities.

10.5. PRICE POLICY

In the light of causes and consequences of inadequate price (impossibility of co-financing the activity; unsustainable development of entities dealing with energy activities), there comes the role of the Energy Regulatory Agency. It should determine the reasonable costs of respective energy activities and propose to the Government such tariff systems and price levels that will simultaneously protect the economy and citizens from monopolistic position of individual entities and allow the energy entities to perform the energy services entrusted to them by the Law, in accordance with the Energy Policy and this Strategy.

In accordance with the Energy Law and responsibilities of the Government, based on the review of the implementation of the Strategy and in cases of inadequate and untimely interest of investors in the construction of new energy sources/facilities, the Government should provide, by special measures such as decisions to increase energy prices, to issue public tenders for new facilities and the like, conditions for energy entities to be able to perform obligations arising from their activity, particularly those related to security and regularity of supply of the consumers with required energy.

In that, when energy price increase is concerned, the increase must be carried out gradually to come to the level of market prices and the Government should provide special social protection program to subsidize a portion of energy expenses (from the budget and/or from increased prices) for socially vulnerable groups of citizens.

Specific technical and economic features of the emerging Montenegrin energy market require a well established system of energy price changes, so that future investors may be generally assured about the consistency and stability of market laws (which is particularly important for transition countries) because political and budget needs must not be the only reasons for undertaking fast steps in the privatization and energy price policy.

10.6. LOCAL AND REGIONAL ENERGY MARKET

Within retail and wholesale elements, efforts should be made to establish a central function at the local market that will enable unimpeded trade in electrical energy. It should be a part of the broader market environment with the following energy trade elements:

- Market administration;
- Managing the market as a whole, to support the work of market operators;
- Measurements;
- Market information; market arrangements through bilateral agreements and with other appropriate options with mandatory balancing mechanism to enable final energy settlement;
- Ancillary services to maintain security and stability of the system.

At the regional level, Montenegro should participate in the creation of the integrated market for electrical energy and natural gas (when conditions are created) on the basis of common interest and solidarity, bearing in mind that Montenegrin integrated market may, at a later stage, also include other energy products and carriers of energy sources such as LPG and natural gas, gasoline, hydrogen or other more important network infrastructure facilities. In that respect, it is necessary to create a stable regulatory and market framework able to attract investments in power generation, construction of energy transmission network and construction of gas network, to enable access to stable and continual delivery of electrical energy, and subsequently gas as well, which is very important for economic development and social stability of the state.

The Energy Law prescribes that the Energy Regulatory Agency (hereinafter the Agency) publishes rules for enabling establishment of organized market where the turnover of electrical energy is performed

through the market operators. The law also envisaged the establishment of market operator as functionally separate entity from integrated electro-energetic entity, which performs operations and management in accordance with the rules and procedures determined by the regulatory authority (the Agency). The market operator is obliged to submit to the Agency, for the approval, rules for market participants and the framework and schedule for creation of market for energy supply.

Within the process of energy sector transformation and in accordance with the powers and responsibilities specified in the Energy Law and other regulations, the Board of the Agency reached a Decision on electrical energy market model in Montenegro. This decision represents one of the key steps in the process, which has as goal enabling of safe and stable functioning of electro-energetic system and regular and qualitative supply of consumers with electrical energy through the introduction of competition in energy industries and opening of energy market.

Bearing in mind the specifics and characteristics of electro-energetic system (the size, permanent energy deficit, possibilities of carrier system, the number and the structure of consumers, availability of measurements, current contracts, etc.), the Agency decided to use market model which will largely correspond to overall conditions in Montenegro. According to this model, the electrical energy market in Montenegro will consist of wholesale and retail market and its opening and development will be performed in stages.

The selected model of wholesale market shall include the following:

a) Market of long-term bilateral agreements
b) Special medium-term market,
b) Short-term – balanced market, and
c) Activities after real time

When deciding for this model, the Agency's view was that the basic purpose of market design was to establish a model which would enable and stimulate participants to cover their needs with bilateral agreements in a way that contracted amounts correspond as much as they can to real needs so that deviations, which are inevitable during work, would be reduced to minimum.

The introduction of the electrical energy market includes the introduction of competition, in so called market activities (generation and supply), while network activities (network connectivity and use of transmission and distribution network), as well as natural monopoly would still be regulated.

The Energy Law prescribes that the energy entities will not participate in any of non-competitive behaviors, including but not limited to cross subsidizing, price or market manipulations, other trade activities harmful for stimulus and protection of competitive market.

The competency of the Agency is to impose any restrictions it deems necessary for prevention of misuses of market authorizations in competitive areas of energy sector or harmful consequences for tariff purchasers.

Therefore, the Agency will set up rules and regulations for promotion of competition, stimulation of market development and right of tariff purchaser to select the supplier, sanctioning and prevention of misuses of market authorizations and any other anti competitive and discriminatory behavior.

The Law prescribes that the generation and supply of electrical energy is performed for the tariff purchasers' needs until the Agency establishes that the competitive electrical energy market is formed.

The Energy Law prescribes that the largest portion of repurchase of electrical energy will be conducted based on concluded bilateral agreements, while the remaining, smaller part of daily needs will be provided at spot market or at the market based on reconciliation of demand and supply.

The agreement on establishing energy community, as one of the key provisions that should contribute to safe and more qualitative supply of consumers in SE Europe anticipates opening of regional energy market. Singing this Agreement, Montenegro bounded itself to open the market for all consumers on January 1, 2008, except for households, and therefore it has accepted as long-term objective to develop its market in the way that is compatible with regional market striving to higher integration with regional and in the future uniform market in EU.

According to the current review, Montenegro will use regional market for purchase of basic energy for supply and for provision of balanced services.

The Agency should monitor energy market to:

- Evaluate the progress achieved in market restructuring in accordance with the legal regulation,
- Evaluate the efficiency of functioning and competitiveness of the market,
- Supervise dominant positions of market participants, identify potentially anti competitive behavior or misuse of dominant position,
- Develop method for improvement of market functioning, prevention and control of dominant positions and market power.

The scope of market monitoring refers primarily to those energy sector activities that are competitive, i.e. market of generation and supply, although there is important connection with activities in relation to the regulated parts of energy sector (network, other infrastructure entities and regulated parts of generation and supply).

It is to expect that the process of market monitoring in Montenegro will be developed in accordance with the development of the market itself, that is to say that it will be necessary to make appropriate adjustments with the achieved level of liberalization of energy sector. Monitoring will contain the following:

- General monitoring of development and restructuring of energy sector,
- Monitoring of wholesale market,
- Monitoring of retail market, and
- Monitoring of safety of supply

However, in the current situation where Montenegro is only at the beginning of creating the conditions for establishment of wholesale market, the initial part of monitoring should be directed to the process of market rules preparation and all other regulatory and technical frameworks needed for opening and functioning of the market.

10.7. ACCESSION TO EU, REGIONAL AND EUROPEAN DEVELOPMENT TRENDS

The objectives of Montenegro's accession to EU, broader regional and European integrations will be achieved by:

- leading a continual and verifiable development policy, financing the exploitation of hydro potential, new renewable sources and combined generation of electrical and heating energy;
- accepting and adopting EU legislation and directives;
- preparing the existing energy entities and consumers for equal participation at the local and regional market, in the first five years of the Strategy implementation already, but in spite of opening up competition in the supply, by providing adequate support to the provider with the obligation of public supply at regulated tariffs;
- providing conditions that, before the expiry of the five-year period (2007-2011), price of electrical energy and network services will cover the expenses of energy entities, including variable costs, maintenance costs, capital expansion costs, costs of energy security and environmental protection, but also the payment security;
- by not later than end 2011, eliminating any state interference in the determination of price for large consumers, because since that time onward these consumers will be totally left to the market.

10.8. NATIONAL SECURITY AND SOVEREIGNTY

The development of energy sector has important impact on the strategy of security and national sovereignty. Possible serious problems can be avoided through timely resolution of the issue of the division of water resources.

Total deficits in the energy area, particularly in the area of energy sector are becoming higher and entering in the area when they jeopardize national sovereignty of Montenegro. The increase in electrical energy

deficit may represent financial burden that is not simple for Montenegro so that it is necessary to consider it from this aspect when determining development priorities.

10.9. TECHNOLOGICAL DEVELOPMENT AND RESEARCH

Montenegro will take determined measures for the introduction of innovations in energy sector because new technologies are of special importance in planning future reliable energy supply, resolving the issue of efficient consumption of energy, sustainability and industrial competitiveness, use of renewable sources and environmental issues.

Technological innovations in efficient consumption of energy must become one of basic programs in the power consuming industry and equipment production.

The use of *energy labels* may help a lot in increasing the scope of research and technological innovations in the industry in that direction.

Energy labeling for buildings will, in addition to heating protection regulations, contribute to the technological development in the areas of insulation techniques and installations in construction.

In order to provide technical innovation and modernization of industry and contribute to energy saving, Montenegro will take into account the IPPC Directive that has made a great breakthrough, as well as the development of BREF document that define the best available technology and optimum energy consumption for a certain type of industry (BAT).

10.10. EDUCATION AND INTERNATIONAL COOPERATION

Montenegro wishes to be a modern and knowledge based, successful society. That requires increasing the quality and efficiency of the educational system and strengthening the role of knowledge as competitive capacity on the global energy market.

Proposal for changes in education system: During the full-time and part-time education, specialists will be educated in the area of energy, increasing their knowledge of efficient use of energy, which will improve the overall economic and social attitude towards energy. Education system should spread knowledge of energy management, of better understanding of energy processes, sustainable development, efficient energy consumption, decreasing negative effect of energy and energy consumption on the environment, decreasing energy consumption and energy expenses, and it should be carried out in an organized way as part of both full-time and part-time education where the students will gain knowledge on the power generation and consumption, and environmental issues:

- special program for technical secondary schools;
- curricula improvement regarding energy management at technical universities;
- additional education (seminars, courses...).

Basic required activities:

- additions and changes to curricula at all levels and all departments
- preparation of teaching equipment for efficient energy consumption and renewable energy sources;
- new study courses in the field of sustainable energy development and
- promotion of extracurricular programs and projects.

Researches in the field of energy, development of local expertise and local experts will have a long-term favorable influence on the economic competitiveness, education and employment of the young, as well as on international recognizability of the state. It is necessary to design a national scheme of researches in the field of energy, to employ new domestic expertise, prevent "runaway" of energy professionals and promote a number of PhD papers. It is also necessary to develop targeted study programs in energy and environment, promote the establishment of specialized and research groups, and finance good programs.

10.11. BOLOGNA CONVENTION

To an appropriate degree, energy, particularly energy efficiency, should be largely represented in lower level schools (primary and secondary schools). That would, in addition to education of technical staff, contribute to raising the public awareness and general culture in all activities, including the field of energy.

For more efficient implementation of strategic goals, a concept of continual education should be introduced in the system of education, so that specialists can have the opportunity to monitor the developments and innovations in modern knowledge and technologies.

10.12. ALTERNATIVE (NUCLEAR) OPTION

In the circumstances of high objectives of preserving the untouchability of Montenegro as an ecological state, especially with respect to air pollution in some areas (e.g. Pljevlja), and the need to increase security of energy supply in the constant part of the load diagram, as an alternative to the proposed significant exploitation of Montenegro's own hydro potential (Moderate Construction Scenario) and coal, there are also voices for introducing *nuclear option*. Significant new and additional analyses, mostly in relation to the issue of possible location and macroeconomic impact on Montenegro, are needed for more concrete decisions regarding such an approach, which is generally associated with neutral opinion of the EU in recent years. A nuclear power plant is currently being built in EU in Finland. It is quite obvious that such an option would contribute to the preservation of the environment, it would drastically influence on the reduction of greenhouse gas emissions, but on the other side, it would bring about the dependence on foreign investor and a high degree of energy dependence on imports of nuclear fuel, and furthermore, due to imported technology, it would cause a significant problem of labor restructuring in electrical industry, mining and associated industries. The question of credibility of Montenegro as an ecological state would also arise (e.g. the question of radioactive waste management and disposal). The Strategy does not foresee such options by 2025.

10.13. PUBLIC AWARENESS AND STRATEGIC COMMUNICATION

In all decision-making processes, particularly in various stages of decision-making in the area of strategic environmental assessment, it is foreseen to conduct active measures for public awareness and participation: it means that public debates should include the largest number of participants.

Access to public documents in relation to possible impact of every specific project on the environment should be ensured, and procedures in connection to such projects and their alternatives should also be subject to transparent monitoring, with participation of domestic and international public.

That is why the presentation and promotion of the Strategy requires a special effort; of importance is not only the communication with employees in the energy sector and Government bodies but also a "partnership" with non-governmental organizations and population.

For the adoption of the Strategy, Action Plan, and successful implementation of the Strategy, it is therefore important to provide consistent communication support at all stages and to all involved sections of the public, among which some will be limited to the territory of Montenegro and some will also have international dimension.

For the successful implementation of the strategic energy development project, strategic public communication management is also needed, because the public expects to be properly informed.

For that reason, a complex approach to the project of communication support to the Strategy and the preparation of a communication strategy is recommended, with a long-term objective primarily to provide favorable conditions for the overall development of energy sector in Montenegro, as one of the crucial pillars of economic development of the state of Montenegro.

11. STRATEGY CONCLUSION

With the assumption of successful institutional reforms and maintenance of macroeconomic stability of Montenegro, the Strategy recognizes the goals and establishes implementation mechanisms in the areas of (i) reliability and quality of energy supply, (ii) competition in energy supply, (iii) protection of the environment, (iv) in other relevant areas (diversification of energy sources, preservation of existing sites for power generation, economically viable use of renewable sources, stimulation of the construction of cogeneration facilities, where there is heating consumption, promotion and introduction of new clean technologies, fostering of domestic production of electrical energy within the allowed mechanisms, optimum reduction of import dependence of the energy system).

Since the legislation in the area of energy in EU has been very quickly revised and actualized, current laws and subordinate legislation acts should be revised in Montenegro to the same extent as well as new ones should be adopted. The revision of the Energy Law is needed; the new Law on the use of mineral raw materials is needed as well as Law on energy efficiency, and the like.

However, due to high demands that have been imposed lately, the energy sector should be strengthened in staffing area in competent ministry. For the resolution of open issues, new employees should be hired from legal area. The Agency for energy efficiency should be established and the renewable sources of energy should be promoted in such or different organization form and entrepreneurship in this sector should be stimulated.

11.1. ACTION PLAN

The Strategy presents the paths, needed measures and steps (the so-called "roadmap") that Montenegro will follow in the implementation of adopted objectives of the long-term Energy Policy. However, the historic experience suggests that declarative documents as per definition require an action plan for the current maintenance of the targeted implementation time schedule.

The Action Plan is essentially a component of the Strategy and is a concrete reflection of strategic perception of the energy development. It should consist of a number of concrete programs and project, the implementation of which will accomplish the Strategy goals, as well as appropriate control mechanism for monitoring and corrective actions.

Large number of comments of different relevance to the Strategy from public discussions (which in essence represent the need for concretization and starting the direct realization) point to the necessity of urgent action and at the same time, to defining of administrative mechanism, which will enable efficient and reliable monitoring of the results achieved, and corrective directions needed.

The objective of the Action Plan in that way is to enable constant testing of strategic decisions (particularly because the Strategy is highly market oriented) and to provide the basis for formal audit of the Strategy five years after its adoption.

In accordance with Montenegrin legislation, the Action Plan will be drawn up by the ministry responsible for energy. The Action Plan will identify specific tasks for the Strategy implementation for at least the first five years of the implementation, together with description of relevant programs and projects, the assignment of tasks among local institutions, expenses, timeframes and manner of funding, and point to special measures (critical paths) required for their implementation.

11.2. STRATEGY IMPLEMENTATION MONITORING OBJECTIVES AND TOOLS

The Strategy will be monitored through the Action Plan, with the main objective to warn about possible delays and to identify and carry out any needed intervention measures. The Action Plan anticipates the researches based on complete documentation, with the intention to analyze investors' interest and with final goal to encourage additional investments in Montenegro.

Monitoring tools will operate at several levels:

- **Annual report of the Ministry**: Ministry responsible for energy will monitor the implementation of the Strategy through an annual review. The annual review of the energy sector will give quantitative and qualitative overview of the implementation of tasks specified in the Strategy on the

basis of a selected system of indicators. Annual review of the energy sector is an annual publication that will present implementation of the Strategy from the aspect of newest changes, events and legislation, connected to energy management in the world and in the EU.

- **Internationally recognized parameters for establishing a degree of implementation of the planned Strategy**: Montenegro will apply the system according to pre-selected indicators that are internationally recognized and will enable quantification and monitoring of the identified Strategy targets. On that basis, assessment of the implementation successfulness and comparison to other states will be made.
- **Periodic updating of the Strategy**: In Montenegro, it is necessary to institutionalize the system for monitoring and control of Strategy implementation, with clear responsibility and authorization. Based on periodic review of the Strategy implementation (the period not exceeding two years), reasons for possible deviations from the Strategy should be carefully analyzed and appropriate measures should be taken to achieve or possibly modify certain goals and activities.

12. SUMMARY OF MAJOR STRATEGY RECOMMENDATIONS

AREA OF APPLICATION	STRATEGY RECOMMENDATIONS
A. ENERGY EFFICIENCY	
ENERGY EFFICIENCY FRAMEWORK	• Adoption of special Law on Energy Efficiency. The Law will anticipate, among other things, the central institution for energy efficiency, which will have the leading role in promoting the energy efficiency as well as Fund for energy efficiency. The Law will also reflect main provisions of EU Directive 2006/32/EC on energy end-use efficiency and energy services and it will introduce concepts of other important directives; • The founding/strengthening and capacity building of the central institution for energy efficiency and founding of the Fund for energy efficiency; • Revision of the Strategy of energy efficiency of Montenegro based on the adopted Strategy and in accordance with the development in the field of energy efficiency in Montenegro and EU; • Establishment of statistical and information system for energy efficiency, which would enable planning and monitoring, as well as it would represent tool for adequate reporting; • Thorough analysis of total losses achieved in energy sector of Montenegro and development of specialized expert study and/or series of sectoral and technological studies for energy efficiency for the purpose of identification of energy efficiency potential and justification of appropriate measures; • Gradual development of overall legislative, regulative and institutional framework for energy efficiency based on relevant EU directives and standards, as well as establishment of mechanisms for adequate application and implementation; • Improvement of international cooperation in the field of energy efficiency; • Promotion of applied research, development, and knowledge transfer in the field of energy efficiency, as well as development of the local energy efficient equipment and material.
EFFICIENT ENERGY CONSUMPTION	• Preparation of EPCG Development and Action Plan which includes activities for energy efficiency; • Preparation of new Study of losses of electric power and energy in transmission and distribution networks of Montenegro and Action Plan for loss reduction up to anticipated technically achievable level of 10% (distribution); • Introduction (where appropriate) of obligations from the energy efficiency area in privatization and concessionary contracts and new licenses before their realization.

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AREA OF APPLICATION	STRATEGY RECOMMENDATIONS
ENERGY EFFICIENCY OF LARGE INDUSTRIAL CONSUMERS	• Expert analysis of large consumers (KAP, Steel Plant and Railways Company of Montenegro) from the aspect of reducing energy consumption, • Introduction of regulatory requirements for large industrial consumers, with mandatory employment of energy managers, preparation of annual/semiannual energy balances, preparation of Action Plans for energy efficiency and implementation of energy efficiency measures!
ENERGY EFFICIENCY OF ALL CONSUMPTION SECTORS	• Promotion of development of local capacities for energy audits, energy management and consulting/engineering of services in the area of energy efficiency. • Reduction of barriers and promotion of alternative mechanisms of financing (negotiating energy characteristics, third party financing, and the like), as well as the development of ESCO companies. • Support of energy analysis of the companies and feasibility studies for investments in energy efficiency and the use of RSE; Provision of financial incentives, technical support, training and sharing of information aiming at special sectors and introducing the appropriate energy efficiency measures. • Gradual increase of all energy tariffs and their approach to market values, giving the right sign to consumers on the importance of energy efficiency (along with the measures of support of socially vulnerable categories of citizens), • Introduction of bonus schemes for energy efficient companies, energy managers and successful projects in the area of energy efficiency, combined with broader publicity.
ENERGY EFFICIENCY IN BUILDING SECTOR	• Introduction of urgent measures for implementation of the existing regulation for thermal insulation along with publicity and informative campaign towards potential owners and renters with a view of creating demand at the market and making pressure to market players for appropriate construction of energy efficient buildings and systems. • Inclusion of the concept and the provisions of energy efficiency in the Law on construction of facilities, • Development of new regulatory framework with the introduction of concept of general requirements for reaching energy characteristics of buildings in accordance with the Directive 2002/91/EC on energy performance of buildings; • Introduction of energy coding schemes and minimum requirements for efficiency with energy consumer devices and equipment; • Regulation for introduction of individual measurement and calculation of energy expenses in accordance with actual consumption; • Measurements for promoting low energy buildings and implementation of RSE in buildings (particularly active and passive solar systems).

AREA OF APPLICATION	STRATEGY RECOMMENDATIONS
PUBLIC SECTOR ENERGY EFFICIENCY	• Introduction of energy management schemes and preparation of plans for energy efficiency at the local level and in public facilities, in combination with training and pilot projects and establishment of centralized monitoring and benchmarking scheme; • Realization of investments and introduction of grant schemes for energy efficiency for broader public sector; • Regulatory introduction of the energy efficiency criteria in public procurement; • Regulatory and other measures for enabling alternative financial mechanisms in public sector (negotiating energy characteristics, third party financing, and the like), • Certification of energy performances of public buildings.
ENERGY EFFICIENCY IN HOUSEHOLDS SECTOR	• Carrying out public campaign of energy saving for general public, • Energy saving in households should be encouraged by free energy counsels, introduce a scheme titled "Counseling citizens on energy efficiency", • Provide financial incentives for energy rehabilitation of residential buildings and use of RSE which would be assigned to citizens based on public announcement, as needed
ENERGY EFFICIENCY IN TRANSPORTATION SECTOR	• Measures for promotion of energy efficiency in transport: drivers' training, effective vehicle maintenance, management schemes for motor pool in public transportation and organization of managing large number of vehicles, • Public campaign for raising general awareness on purchase/use of energy efficient vehicles/vehicles on alternative fuels, on efficient vehicle maintenance and the manner of driving with low level of consumption.
B. POWER SUPPLY STRATEGY	
REVITALIZATION AND RECONSTRUCTION OF EXISTING FACILITIES	◦ Existing power generating plants should be reconstructed and revitalized with a view to environmental stabilization, increased generation efficiency and improved performance of existing plants; ◦ In order to provide relevant data for the revitalization and reconstruction of HPP Piva, activities should be intensified on the preparation of feasibility study for the reconstruction and modernization of plants and equipment, the increase of plant preparedness and work safety, and possible increase of power of generators in this plant. ◦ The Strategy also recommends the intensification and finalization of examination of possibilities for the incorporation of the 8th generator in the Hydropower Plant Perucica (66/58.5 MW), which would increase the overall capacity of existing plants by 95.5 MW!
CONSTRUCTION SCENARIOS FOR NEW ENERGY FACILITIES	• Based on former analyses of possibilities for the construction of new generation facilities – power plants, the Strategy recommends the construction of new plants according to the analyzed Moderate

AREA OF APPLICATION	STRATEGY RECOMMENDATIONS
	Construction Scenario;
NEW THERMAL PLANTS: TPP PLJEVLJA 2 AND TPP BERANE	• Intensify investigation work to ensure sufficient quality basic data for making investment decisions for construction of TPP Pljevlja 2 with Coal Mine Pljevlja; • Build TPP Pljevlja 2 (with foreseen subtraction of heat for heating city of Pljevlja from TPP Pljevlja (1+2); • Continue with coal research in Berane; adopt a decision on construction of TPP Berane based on investors' interest, and results of economic estimates of feasibility of construction.
NEW HYDRO POWER PLANTS (>10 MW): HPP ON THE MORAČA RIVER, HPP KOMARNICA, HPP BOKA	• Intensify research works of anticipated sites to ensure sufficient quality basic data for making investment decision for construction of new large HPPs; • Intensify analysis and researches to ensure sufficient quality basic data for making investment decision for construction of HPP Boka.
HPP ON THE MORAČA RIVER	• Intensify investigation works to ensure sufficient quality basic data for making investment decision for construction of HPP on the river Morača, • Build HPP on the river Morača.
HPP KOMARNICA	• Intensify researches to ensure sufficient quality basic data for making investment decision for construction of HPP Komarnica, • Build HPP Komarnica.
SMALL HYDRO POWER PLANTS	◦ Undertake further activities to encourage construction of small HPPs under the principle of assigning concessions for water courses, research, and technical and economic use of water and energy potential for generation of electrical energy in small hydro power plants, individual installed power up to 10 MW.
REVITALIZATION AND DEVELOPMENT OF INTERNAL AND CROSS BORDER TRANSMISSION NETWORK	◦ Analyze further development of transmission network, internal and cross border, with a view of guaranteeing high level of security of supply and functioning of network, supporting the creation of national and regional market of electrical energy and directly connecting and integrating Montenegro into the EU electrical energy market through Italy, ◦ Establish consistent rehabilitation program of the existing transmission network to improve safety and reliability; ◦ Reconstruct the existing and build new transmission network facilities.
REVITALIZATION AND DEVELOPMENT OF DISTRIBUTION NETWORK	◦ Analyze further development of distribution network with a view of guaranteeing high level of security of supply and network functioning, ◦ Establish consistent rehabilitation program of the existing distribution network to improve safety and reliability; ◦ Reconstruct the existing and build new distribution network facilities.
C. NATURAL GAS SUPPLY STRATEGY	

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AREA OF APPLICATION	STRATEGY RECOMMENDATIONS
INTRODUCTION OF NATURAL GAS AND LPG	◦ Introduction of LPG as energy substitute and as predecessor to natural gas is recommended; ◦ Foresee construction of gas lines in accordance with Adriatic-Ionic Declaration of Ministry and further researches.
D. LIQUID FUEL SUPPLY STRATEGY	
SUPPLY OF LIQUEFIED PETROLEUM GAS (LPG)	• Introduction of LPG system in tourism is recommended;
SUPPLY OF PETROL DERIVATIVES	• To preserve operational reserves of petrol derivatives sufficient for 45 days, the use of existing storage facilities is recommended; • Construction of additional storage facilities for obligatory 90-days reserves of petrol derivatives is recommended;
E. HEATING SUPPLY STRATEGY	
HEATING ENERGY SUPPLY	◦ Analyze the need and possibility of the development of remote heating system for Nikšić, Bijelo Polje, Cetinje and Berane, as well as the need and possibility for other towns in Montenegro; ◦ For the needs of remote heating in Podgorica, the use of residual heat from the process of waste incineration or similar processes, as the most competitive one, is recommended; ◦ As a possible option for introducing remote heating system in smaller local communities in the municipalities of Kolasin, Zabljak and Pluzine, the use of waste heat from industrial processes, waste incineration or the use of biomass is recommended;
HEATING SYSTEM FOR THE CITY OF PLJEVLJA	◦ It is recommended to revise the existing and prepare new needed feasibility studies of construction of the heating system for the city of Pljevlja; ◦ In the coming period, it is necessary to intensify investigation works in order to ensure sufficient quality basic data for making informed investment decisions for the construction of remote heating system in Pljevlja; ◦ Build heating system for the city of Pljevlja.
F. STRATEGY OF INTRODUCTION OF RENEWABLE SOURCES OF ENERGY (RSE)	
RSE INTRODUCTION STRATEGY	◦ The use of RSE of at least 20% of total primary energy consumption in accordance with goals set by EU-member states!
RENEWABLE SOURCES OF ENERGY	◦ Support investors who invest in the use of RSE;
SMALL HPP	◦ Intensify research works of the anticipated sites to ensure sufficient quality basic data for making investment decisions for construction of small HPPs,

AREA OF APPLICATION	STRATEGY RECOMMENDATIONS
	◦ Remove legal and other barriers for faster investment in projects for construction of small HPPs, ◦ Build small HPPs (of at least 80 MW).
WIND ENERGY	◦ Intensify preparation of additional studies of possible use of wind energy in Montenegro and determine micro-locations with the largest wind power, ◦ Intensify investigation works at the so determined micro-locations in order to ensure sufficient quality basic data for making investment decision for the construction of wind plants; ◦ Remove legal and other barriers to faster investments in wind plant projects; ◦ Build wind plants (of at least 60 MW).
ENERGY FROM WASTE	• Intensify investigation works concerning micro-locations and capacity of industrial plants for waste incineration; • Intensify preparation of additional studies on possible use of waste energy in Montenegro for the production of electrical and heating energy, as basic data for making investment decisions;! ◦ Build waste plants in the area of Podgorica.
SUN ENERGY	◦ The use of direct sun energy for heating, preparation of warm water and other low-temperature processes is recommended;
BIOMASS ENERGY	◦ Make additional assessment of the availability of biomass resources in Montenegro and prepare feasibility studies in local conditions to determine the economic potential of using biomass in specific projects, ◦ Build biomass cogenerations (of at least 5 MW).
BIOGAS	◦ The development of additional assessment of the availability of biogas resources in Montenegro and preparation of feasibility studies in local conditions to determine the economic potential of using biogas in specific projects is recommended.
BIOFUEL	◦ The development of additional assessment of the availability of biofuel resources in Montenegro and preparation of feasibility studies in local conditions to determine the economic potential of using biofuel in specific projects is recommended;
G. STRATEGY OF CO-GENERATION INTRODUCTION AND LOCAL ENERGY DEVELOPMENT CONCEPTS	
CO-GENERATION INTRODUCTION STRATEGY IN COMPLIANCE WITH THE DIRECTIVE 2004/8/EC	◦ Preparation of additional assessments of availability of resources for introducing industrial and small co-generation plants in Montenegro and feasibility studies in local conditions is recommended in order to determine economic potential of using co-generation in concrete projects; ◦ Introduction of legislative and regulative framework for CHP pursuant to the Directive 92/42/EEC (2004/8/EC).
LOCAL ENERGY DEVELOPMENT STRATEGY	◦ Modernization of existing boiler rooms using coal and gradual LPG substitution is recommended; ◦ Preparation of additional assessments of availability of resources for the local energy development in Montenegrin municipalities and

AREA OF APPLICATION	STRATEGY RECOMMENDATIONS
	feasibility studies in local conditions is recommended in order to determine economic potential of using local energy development in concrete projects; ◦ Anticipate future development of gas network in bigger cities and start preparing projects and developing infrastructure.
H. ENERGY PRICE MATCHING	
ENERGY PRICE POLICY MATCHING IN MONTENEGRO	◦ Regulatory agency should determine reasonable costs of appropriate energy activities and propose to the Government such tariff systems and price levels that simultaneously protect the economy and citizens from monopolistic position of individual entities and enable energy entities unimpeded conduct of energy business allowed to them by the Law, in accordance with objectives of Montenegrin Energy Policy and this Strategy; • Putting in place of a mechanism for establishing and changing energy price in Montenegro before company privatization is recommended; • Gradual increase in energy price is recommended, in order to come to market prices and the preparation of a special Government program for the social protection and subsidizing of part of energy expenses (from the budget and/or increased prices) to socially vulnerable categories of citizens.
I. PRIVATIZATION OF THE POWER SECTOR	
IMPORTANCE OF POWER SECTOR PRIVATIZATION	• Due to lack of portion of funds, and necessity of investing in energy sector on the other hand, it is possible to create basis for the development of the sector through the form of privatization of private-public partnership.
J. PROMOTION OF INVESTMENTS AND CAPITAL MARKET	
PROMOTION OF INVESTMENT IN ENERGY SECTOR OF MONTENEGRO	• It should be useful to establish a unit for promotion of investments in the energy sector on the basis of a "one-stop-shop principle", the main objective of which will be to ensure updated and relevant information to the interested investor.

13. CONCLUSION

Montenegro, after a longer period of time, has a clear Energy Policy supported by the Strategy. To achieve the foreseen ambitious plans, Montenegro needs a broader coalition and strongly coordinated action of all stakeholders inside and outside of Montenegro.

The development of energy sector in Montenegro is based on better and more efficient utilization of its own resources, since Montenegro has an interest primarily in taking advantage of favorable domestic sources and thus decreases the import energy. This will directly influence on the accelerated development of the economic system of the state and also better quality of living for its citizens.

Main macroeconomic effects of the construction of new energy facilities are certainly: the increase in Gross Domestic Product, reduction in energy imports, decrease of foreign trade deficit, opening of new industrial sectors and thereby increase in employment, and finally, in international terms, increase of competition of Montenegrin economy. Moreover, due to new initiatives in energy industry, in various new development sectors increased overall entrepreneurship initiative will no doubt come to surface and related employment opportunities.

With the introduction of innovations in energy, encouragement of diversification in the use of different types of energy, and strategic choice of partner states, when energy import or export is concerned, Montenegro will really create favorable conditions for the development of energy and entire economy, additional job positions, higher security in energy supply and cleaner environment.

By implementing the Strategy, Montenegro will make a large step forward with respect to security of energy supply, because the Strategy envisages in the future the connection of EES of Montenegro with all neighboring states and the use of trans-European major routes of natural gas.

Due to a long interruption in the construction of its own energy sources, extremely high import dependence on more than 1/3 of energy needs, large unutilized potential of high quality from the aspect of energy, domination of electricity in energy balance, high amortization of energy infrastructure and the need for its accelerated revitalization and technological modernization – are reliable facts, due to which it is necessary to start construction of new generation sources. The construction of hydropower plants very successfully fits into the measures of integrated land management, urban development and much more successful valorization of waters, water courses and mountain areas in tourist industry. It is a very important strategic determinant that such a construction, which entails appropriate economic and infrastructural facilities and tertiary service facilities, creates conditions, primarily in tourism, to keep the people in the mountain regions, because they will have the opportunity to conduct business and will be provided with excellent communication connections with urban centers.

Advantage is, by all means, given to renewable sources of energy. Any alternative, not giving advantage to renewable sources, is economically unreasonable. The construction of new hydropower plants, in addition to additional annual generation of energy, also enables better development of local communities in the zones and better regional development, because energy facilities are always followed by parallel construction of infrastructure. Better use of renewable hydro energy at favorable rates is of national interest, primarily due to increasing independence, security, stability and competitiveness of the Montenegrin EES. The reduction in import dependence may also be achieved by constructing a larger thermal power plant that would use domestic coal.

The Strategy is not a fixed document. It will be renewed every several years, along with Action Plan, but always in consideration of the newly created conditions, both in the energy sector in Montenegro and in broader energy environment.

Timely decisions of all relevant decision-making factors in the state and determined enforcement of the adopted decisions will be a reliable guarantee to Montenegro for the successful accomplishment of the assumed tasks and targeted development objectives in the field of energy.

Future economic development of each country is naturally always connected with numerous doubts, and conflicting situations and interests; their timely resolution is extremely important for the implementation of programs and projects in energy, which are as a rule, long-term programs, with long lasting preparation

and implementation, while their final positive effects in commercial exploitation are achieved only later, both in respect to population and general public.

Main macroeconomic effect of the application of construction of new energy facilities will bring Montenegro increased GDP, decreased energy imports and reduced foreign trade deficit, opening of new development possibilities with increased employment and sustainable environmental development and, eventually, **increased competitiveness of the OVERALL Montenegrin economy**.