ENERGY MANAGEMENT AND RENEWABLE ENERGY RESOURCES AS DEVELOPMENT FACTORS OF THE REPUBLIC OF SERBIA

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ABSTRACT

Energy is one of the strategic resources in the development of economy and society in general, and constant growth of energy prices is reality. On the other hand, oil and gas reserves are limited to and concentrated in a few countries. Considering the fact that there will be significant increase of population on the planet in the future, most countries endeavour to reduce imported energy consumption, which forms the basis for economic development and improvement of standards of living. Due to aforementioned, energy efficiency increase, employment of renewable energy resources and constant care for the environment are basic elements in the concept of renewable development.

Key words: energy management, renewable energy resource

1. INTRODUCTION

Nowadays, energy is one of the most important elements of development of economy and society. Energetic has crucial geopolitical magnitude, where climatic changes and energy supply stability make dominant contribution, taking into account, above all, the fact that oil and gas reserves are limited and concentrated in a few countries. According to some research, world’s energy demands will rise at 1.8% rate by 2030, and if nothing is done, fossil fuels will meet 88% of total energy demands on the planet. There is a common opinion all over the world that the current consumption and use of resources is unsustainable. Namely, due to uncontrolled growth of world population, economic development and climatic changes, water, food and energy scarcity will occur for the first time in 2030. Today, about 4 billion tons of oil is used per year, which in comparison with total oil reserves of 120-160 billion tons leads to a simple conclusion that present oil reserves will be depleted in a less than 40 years. Gas reserves will be depleted in about 60 years if this tendency continues, while coal reserves will be depleted in about 200 years. As it was forecasted by one of the most relevant institution dealing with global analyses of DOE-IEA, the oil barrel price will reach 200$ in 2030. We have become aware of the fact that non-renewable energy sources, and above all, fossil fuel resources, are limited and unevenly distributed, as well as that, multinational funds, together with political influences will have a greater role on the world energy market. In the last two decades, energetic has become global, and availability of various energy forms, as well as reasonable use of energy have become major factors of development of some countries and the world as a whole. Because of that, industrial western countries commenced rational consumption of fossil fuels by increasing energy efficiency and by more intensive use of renewable energy resources.
2. EXISTING ENERGY SITUATION IN SERBIA

Energetic dependence of Serbia moderately grows. The greater that dependence is, the more sensitive to disturbances in the world's energy market its economy becomes. The projected energy dependence for 2010 is more than 50, 9% more than estimated import dependence in 2007, being 41%. According to energy balance of the Republic of Serbia for year 2008, planned net import of primary energy was 6,490 million tons of equivalent oil (Mtoe), and it grew for 6% in comparison to 2007 when it was estimated at 6,139 Mtoe. The fact that Serbia is most energy dependent on imported oil and gas implies on emergency for rational energy consumption through increasing energy efficiency and investigating possibilities of using local available renewable energy resources. Apart from abovementioned, according to the Freedom House Report for year 2008 “Serbia is one of the greatest consumers and pollutant in the West Balkan”. Carbon dioxide emission is 6.6 times more than world’s average, i.e. 11 times more than OECD average. Primary energy consumption by unit of gross domestic product in some sectors is five times more than world’s average, i.e. up to 8 times more than in OECD countries.” [2] Consequently, economy produces goods that are uncompetitive; households pay a lot of money for used energy, while the state spends more money for energy import. As a result of poor investment in energy infrastructure for past decades, energy efficiency in Serbia has recently been up to 2.5 times lower than in the European Union countries. Necessity to use renewable energy in Serbia, as well as in the world, becomes more and more topical, which culminated with so called “natural gas crisis” at the beginning of 2009, when Russia ceased gas to Ukraine, which further led to total gas reduction to several European countries including Serbia. Concerning that already important energy issue often depends on economic and political relations of countries, it is necessary to turn to local available energy resources in order to avoid dependence on some energy sources owned by few states. Due to all abovementioned, energy management should be capable to plan work of energy plants depending on the amount and type of energy at disposal.

3. ENERGY MANAGEMENT

“Energy management most generally means management of energy flow parameters within an organization, starting with the process of energy production and supply, through transformation to the final energy consumption. The term “energy flow parameters” implies various quantity and quality parameters used for describing some of the processes from technical, economic, and social aspect, as well as from the environmental aspect.” [3] The present energy management in Serbia is mostly oriented towards activities of providing optimal energy supply, maintaining energy plants, and planning and realization of new investments. Energy management focuses on technical aspect of energy production (solving issues of maintaining energy systems), while financial aspect of energy management (e.g. energy supply) is separated from technical aspect - providing services. Supply and payment for energy is mostly performed by financial services, while energy management does not have much influence on those activities. Under such conditions, the issues of using renewable energy resources, reduction of bad effects on the environment, as well as the issue of energy efficiency all stand back. Therefore, it is necessary to transform such system. By adopting a strategy of energy development of the Republic of Serbia for the time period 2007-2012, it has been planned for the energy managers to carry out the following activities which present adjusting energy sector functions with the EU directives:

• To prepare plans and programs for using renewable energy resources and their implementation,
• To promote and implement energy efficiency provisions at local level,
• To constitute energy management as an instrument for implementation of energy policy in municipalities, i.e. constitution of energy manager function, being the major carrier of these activities at local level.

If the primary goal of energy policy was increasing energy efficiency and introducing renewable energy resources and major activities of energy management were oriented towards them, there will be some savings that might amortize investments in realization of concrete provisions of energy efficiency. After paying off investments, the budget saving may be used for other purpose, e.g. development of energy systems based on renewable energy resources.

4. ORGANIZATION AND MANAGEMENT IN ENERGY MANAGEMENT

Pursuant to the Law of Energetic, the Ministry is in charge of preparation, implementation, and observation of energy policy of the Republic of Serbia. Accordingly, organization and realization of the project for strategy of development of the Republic of Serbia energetic by 2025, with projections by 2030 is under the Ministry, while at local level, there should be a service and individuals in charge for implementation of
energy management at local level in each municipality. Local authorities work according to the Project for implementation of energy management in municipalities.

The Project management board will be constituted for managing the Project of strategy development, and it will be based in accordance with the Government regulations. The board will have 3 representatives from the Ministry, 1 representative from the Agency for Energetic, and 1 representative from the Agency for Energy Efficiency. The chairman of the board for managing the Project is a minister in charge for mining and energy industry. A working group of the Project for coordination of professional activities (further: Working Group) will be constituted for the needs of the Project realization, and by the act of the Minister in charge for mining and energy industry, and in accordance with provisions for the government, prescribing the principles for internal organization and systematization of posts within ministries. Tasks of the Working Group will be defined by the Act of its constitution, and they should be made of the following activities:
1) to define and adjust project tasks for experts and expert teams in cooperation with the Ministry sectors and departments, and send them to the Project management board for adoption. The Project task is defined by the Working Group leader.
2) the Project management board proposes institutions for making contracts and experts that will be the part of expert teams.
3) it proposes the text of the contract to be signed with institutions whose experts will be engaged in study. The contract form is defined by the Chairman of the Working Group.
4) it coordinates and observes activities of experts, i.e. expert teams.
5) it reviews the reports and sends them to the Board for adoption.
6) it meets with expert teams at least once in three weeks.
7) it organizes public discussions.
8) it reports on the Project to the Project management board.
9) the chairman of the Working Group observes and coordinates activities of other Working Group members, all expert teams and the Ministry sectors and departments for sustainable development.
10) the Working Group consists of: Assistant Minister in the Sector for general energetic, being the Working Group chairman, and who coordinates activities of all expert teams, and being also in charge for coordination of the expert team activities for energy balance and energy planning. Employees in sectors and departments within the Ministry are obliged to provide help in the activities of the Working Group members, and to perform the Project activities upon its demand. Related to that, temporary changed work organization in the Ministry, and the engagement of state officials in the activities of making the Strategy of energetic development may be additionally provided by a directive of the Minister of Mining and Energy Industry. Technical, legal, and economic analysis of particular energy field, prepared by each sector, i.e. department in charge for particular expert team, is prior to the preparation of the Project tasks for expert teams. Based on these analyses, the sector, i.e. department suggests the number and the profile of experts to be members of certain expert teams. Based on this, the Project tasks for these experts are prepared, and in that way their role in team is also defined. Sectors and departments for sustainable development of the Ministry for Mining and Energy Industry have a task within their jurisdiction to:
1) Take part in realization of all activities on making and adopting new strategy through activities of the Working Group members and experts, i.e. expert teams.
2) Prepare project tasks for experts and expert teams in their field, and to coordinate them.
3) Prepare contracts and monitor their realization.
4) Monitor work of experts and review reports made by experts and expert teams.
5) Organize meetings with experts and other people involved in the Project.
6) Prepare the structure of GIS energy data base in cooperation with other expert teams and sectors in the Ministry for Mining and Energy Industry.
7) Send reports to the Working Group members on situations and problems and other.
8) Sector for general energetic has a task to, apart from duties concerning coordination of expert team work, monitor, and harmonize work of all other sectors and their expert teams on this Project.

3. Expert teams
There are following expert teams:
1) An expert team for energy balance and energy planning
2) An expert team for production, refinement and transportation of raw oil and its derivatives
3) An expert team for production, transportation, and distribution of natural gas
4) An expert team for coal production
5) An expert team for production, transportation, and distribution of electric power
6) An expert team for production, distribution, and supply with heat
7) An expert team for energy efficiency in energy consumption sectors
8) An expert team for renewable energy resources
An expert team for the environment protection.

Each of abovementioned expert teams will, within the text for strategy creation being submitted with reports, elaborate international-legal aspect of a module, i.e. field to which a team is assigned, implying: the level of compatibility of acts and other regulations with the EU law, liabilities and activities coming from bilateral and multilateral agreements and membership in international organizations, results and possibilities for using resources of the EU Access Funds and other international funds. Each of expert teams listed under items from 1 to 9 has a task to cooperate with other expert teams, to define, i.e. modify requisite structure of GIS energy data base and to input collected and processed data into GIS energy data base of the Ministry. Expert teams listed under items from 2 to 9 have a task to prepare the following reports: periodic reports on the realization of the Project task, with text for creation of new strategy with background, the preliminary report of realization of the Project task, with text for creation of new strategy with background, the final report of realization of the Project task, with text for creation of new strategy with background, the report on the results of public discussion with the text for creation of new strategy with background, the report of input data in GIS energy data base in the Ministry of Mining and Energy Industry.

5. OBJECTIVES OF THE REPUBLIC OF SERBIA CONCERNING USING RENEWABLE ENERGY RESOURCES

Serbia has at its disposal significant energy potential of renewable energy resources (OIE). This energy potential is mostly contained in biomass and watercourses, and there are a few more significant OIE in Serbia: geothermal energy, wind energy and solar energy. The strategy of development of the Republic of Serbia energetic by 2015 recognizes importance of using OIE. Use of renewable energy resources is mentioned regarding all groups of objectives defined in the Strategy: basic energy, special technological and ecological and general development, and strategic objectives. Use of OIE and new more energy efficient and environmentally accepted energy technologies and equipment for energy exploitation is defined as the third, particular priority of development of the Republic of Serbia energetic (total five priorities have been defined). Three objectives concerning more intensive use of OIE have been defined by the Program of realization of the Strategy for development of the Republic of Serbia energetic by 2015 for the time period between 2007 and 2012:

1) creation of stimulation regulation frame for more intensive use of OIE,
2) making and implementation of financial provisions to stimulate use of OIE and,
3) making and implementation of non-financial provisions and activities to stimulate use of OIE.

The same document specifies plans for construction of new capacities for using OIE by 2012, and those are: small hydro power plants 61MW, biomass fuel boiler 110MW, biogas fuel plants for producing electricity and heat 3.5 MW (of electric power), installation of solar (thermal) collectors 22,000 m², wind power plants 26 MW, geothermal plants 92 MW, and plants for production of liquid biofuel. OIE for 2.2%, regarding total electricity consumption in 2007, and that presence of biofuel and other renewable resources fuel on the market is 2.2% in comparison to total fuel consumption in transport, calculated through energy contents.

According to the Decree of amendment for Decree on the Program of Energy Development Strategy of the Republic of Serbia by 2015 for the time period between 2007 and 2012, major objectives of the Program concerning biomass in Serbia are as follows:

- efficient use of available resources for energy production,
- reducing emission of gases with greenhouse effects,
- reducing dependence on import and,
- creating new posts.

Apart from that, the Republic of Serbia ratified the Treaty establishing Energy Community, signed between the EU and Southern European countries, accepting new obligations related to OIE implementation. Concerning the European Union Law, since Serbia has strategic aim to approach the EU as soon as possible (which implies implementation of corresponding laws and standards), it is particularly important to mention Directive 2009/28/EC promoting use of energy from renewable resources and determines common frame for promotion of energy produced in such way. This Directive sets compulsory national objectives for total energy share from renewable energy resources in final energy consumption, and for share of renewable energy resources in transport: at least 20% of energy share from renewable energy resources in final energy consumption in the EU, and 10% of energy share from renewable energy resources in energy consumption for transport by 2020. Besides, criteria for sustainability of biofuels and liquid biofuels have been established. Recently, introduction of obligation to build energy and/or CO₂ neutral buildings in the EU by 2018, i.e. 2020, has been mentioned more and more often.
6. THE EU DIRECTIVES ON RENEWABLE ENERGY RESOURCES PROMOTION

The Republic of Serbia has assumed obligations to enable development of energetic based on renewable energy resources (above all biomass) in order to reduce and limit emission of gasses with greenhouse effect by signing the Kyoto Protocol, the Treaty establishing Energy Community between the EU and Southern Europe countries, and other international treaties. By ratifying the Treaty establishing Energy Community between the EU and Southern Europe countries the Republic of Serbia has assumed the obligation to implement directives aimed for more intensive use of renewable energy resources, and those are the following:

- **Directive 2001/77/EC** on the promotion of electricity produced from renewable energy resources in internal electricity market
- **Directive 2003/30/EC** on the promotion of use of biofuels or other renewable fuels for transport
- **Directive 2001/77/EC** (published in the EU Official Gazette L283/33 on September 27, 2001) defines renewable energy resources as non-fossil energy sources in the nature, renewing completely or partially, and particularly: wind, solar energy, geothermal energy, sea wave energy, tide energy, hydro energy, biomass, landfill gas, and wastewater gas. Directive 2001/77/EC anticipates establishing national objectives for consumption of energy produced from renewable energy resources, defining provisions and programs for their achievement, being revised every 5 years, and the Member States are obliged to send the report to the European Commission on this achievement. Based on reports by Member States, the Commission will estimate the progress of Member States in achieving their nationally significant objectives, in accordance with globally significant objective being 12% of gross national energy expenditure by 2010. The Commission reports its conclusions every two years. Directive anticipates commitment to:
  - issue guarantees of origin for electricity produced from OIE. Guarantee of origin should comprise the following information: Energy source for electricity production, date and place of production, and in the case of hydro power plants, capacity, which will all be confirmation to producers of electricity from OIE that electricity they retail really comes from OIE, and in terms of this Directive.
  - Obligation of states to analyze and promote existing legal frames and administration procedures necessary for construction and exploitation of plants producing energy from OIE.
  - establish obligation for transmission and distribution system operators to take over and transfer electricity from OIE with possibility of providing priorities for grid access, and to avoid discrimination of electricity from OIE produced in periphery regions, such as islands, and regions with low population density.
  - Clearly define technical specifications and tariffs for connection to the grid and conditions for rehabilitation of electro power system. [4]

**Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport**

This Directive aims at promoting the use of biofuels or other renewable fuels instead of diesel and petrol for transport in order to contribute to objectives such as meeting commitments regarding climatic changes, environmentally friendly security of supply and promotion of energy from OIE. Directive defines biofuel as liquid or gaseous fuel for transport derived from biomass, being biodegradable fraction of the products, waste and residues from agriculture, forestry and related industries, as well as biodegradable fraction of industrial and city waste. Directive 2003/30/EC sets a commitment for states to provide minimum proportion of biofuels (2% of total amount of fuels used for transport by the end of 2005, i.e. 5.75% by the end of 2010). The commitment of the Member States is to report to the European Commission on the measures taken to promote use of biofuels for transport, as well as total sales of transport fuels in the market with the share of biofuels (pure or blended). The conclusion of the Commission, based on the measures taken for use of biofuels in past period, is that the share of biofuel use of 5.75% by the end of 2010 will not be reached, and that it will be about 4.2%. Concerning objectives such as strategic climate change, energy security and economic competitiveness, and that some commitments from previously abovementioned Directives will be in effect by the end of 2010, the European Parliament and the European Union Council have published in the EU Official Gazette L140 from June 5, 2009, **Directive 2009/28/EC on promotion of use of energy from renewable resources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.** According to Directive 2009/28/EC and “in order to reduce greenhouse gas emissions and reduce its dependence on energy imports, the development of OIE should be closely linked to increased energy efficiency”. Directive defines OIE, anticipated establishing of OIE share for each Member State, with obligatory objective of total 20% OIE share in the EU consumption by 2020. Individual objectives for the EU countries vary, so the highest standards of OIE share have been set by Sweden with 49% OIE energy, Denmark with 30%, Letonia with 40%, where the large portion of energy has already been derived from OIE. On the other side, there are countries where large amounts of fossil fuels have been used traditionally, such
as Great Britain whose OIE share was 11% in 2005, and those countries will enlarge energy share from renewable resources up to 15%, while Luxemburg with 0.5% of OIE energy from 2005 will reach 11% in 2020. [8] Based on anticipated national objectives for consumption of OIE electrical power, all Member States should define programs for using OIE by December 31, 2011. The objective to reach 20% from OIE is extensive and involves sectors for energy production, transport, heating and cooling, and it will require mass changes in terms of production, transport, and consumption of energy in the European Union, implying simplification and reduction of barriers and administration procedures that might imperil adequate market functions. According to this Directive, each Member State should provide energy share from OIE in transport at least 10% by 2020. It should be mentioned that this is the first Directive of the EU that mentions the Treaty establishing Energy Community, and that anticipates measures for cooperation between the European Union Member States with Southern Europe countries which ratified the Treaty establishing Energy Community in the field of renewable energy resources. By implementing these Directives, the Republic of Serbia gives its contribution to preservation of the environment, improvement state of energy, and therefore improvement in national economy. Putting the Treaty establishing Energy Community in Europe into the force, managers are obliged to make a plan for implementation of abovementioned Directives from OIE field. Nevertheless, there are no regulations in the Republic of Serbia for regulation of use of OIE, as well as regulations for designing, creation, control, and installation of equipment used by OIE, and there are no accredited certificate laboratories for OIE plants. There is also a lack of standards for equipment and procedures for use of OIE, which have already been established in this field in the European Union. If Serbia gets the candidate status for the EU membership soon, energy management has to harmonize national legislation with the EU legislation, as well as to establish whole system of information and education of population, and to provide quality statistical data for defining strategies for implementation of OIE.

5. CONCLUSION

Energy dependency of Serbia in the past years notes increasing trend and it is about 42%. Changes in energy sector require review of lively events in energy field in our country as well as in the world. If Serbia gets candidate status for the EU membership, major activities have to be directed towards assuming and implementation of EU legislation, and towards improvement of competitiveness of its economy by reducing energy dependence of Serbia, and through improvement of energy efficiency and implementation of renewable energy resources, being priority objectives of management, and if the whole system is set in accordance with that, it is possible to expect that the system will pay off itself and realize additional savings. Great losses and irrational energy consumption, as well as growing import dependency are sufficient reasons for Serbia to include improvement of energy efficiency, and implementation of local, particularly renewable energy resources into its development priorities. Implementation of almost completely neglected renewable energy resources having evident potentials in Serbia, offers itself as one of the solutions that should lead to preservation of remained resources, preservation of the environment and sustainable development of energetic. The role of renewable energy resources is important, both from economic development standpoint, and from the standpoint of finding solution to the problem of the environment pollution.

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