



# *Energy Strategy of Republic of Srpska up to 2030*

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*Banja Luka, February 2012*

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## 1. INTRODUCTION

Energy strategy is a set of goals and measures for implementation of policy of Government of Republic of Srpska in energy sector. The Government's policy is expressed by strategic goals on the level of energy sector as well as by specific targets for individual parts of energy sector.

Energy strategy of Republic of Srpska (hereinafter: Strategy) is made based on principles of the world's best practice, taking into account global trends in energy sector, energy policy and legislative of the European Union (EU) for energy sector, the document "Fundamentals of energy policy of Republic of Srpska" from November 2008 and certain attitudes and recommendations of non-governmental organizations that are active in Bosnia and Herzegovina (BIH).

One of the main guiding principles of Strategy is sustainable development of the energy sector, i.e. the principle of satisfying the present energy needs without endangering at least the same possibility for future generations. One of the specific characteristics of the Republic of Srpska regarding this is that the reasonable measure in utilization of local energy sources (primary coal) for electricity generation designated to export needs to be chosen.

The Strategy focuses the development of energy sector in Republic of Srpska on using domestic resources, inclusion of renewable energy sources for meeting energy demands, inclusion and stimulation of energy efficiency measures and use of modern energy technologies. At the same time the Strategy requires preservation of the environment and reducing harmful impacts of the energy sector to a minimum.

Development of the energy sector in Republic of Srpska is considered in terms of gradual market opening, introducing competition and setting energy prices to the economically sustainable level. Economic possibilities of Republic of Srpska and its citizens are also considered, because this has primary impact on possibilities of energy sector development.

The strategy encompasses all elements of the energy sector, from individual sectors (coal, oil, gas, electricity, etc.) to the legal, organizational and institutional moments that are important for successful operation and development of energy sector in the observed period (up to 2030).

## 2. VISION, MISSION AND OBJECTIVES

### Vision

The period until 2030 is the period in which the Republic of Srpska will finish the economic transition and in all elements will be harmonized with European environment and it is also a period in which Bosnia and Herzegovina will become member of European Union.

Development of energy sector monitors the needs of Republic of Srpska by ensuring sufficient quantities of energy, by technological development, increase of energy efficiency, use of renewable energy sources and taking commitment to protect the environment.

The Strategy directs legal, institutional, organizational, economic and technological processes in Republic of Srpska towards achieving modern standard of energy sector management and organization of open market of energy based on the economically viable energy prices taking into account the energy poverty.

### Mission

Energy is irreplaceable need of economy and citizens, the generator of development in technological, scientific, educational and economic sense.

The role of energy sector is to support growth and development of economy in Republic of Srpska taking into account environmental protection. The energy sector development will bring to technological development, strengthening of domestic companies, investment increase and competitiveness increase in economy of Republic of Srpska.

### Objectives

The general objectives of the Energy strategy of Republic of Srpska are:

- Provide the required amounts and forms of energy and security of supply for the needs of economy and citizens in the area of Republic of Srpska, with economically viable prices taking into account the problem of energy poverty.
- Increase the efficiency of generation, transport and transmission, distribution and energy consumption, especially in buildings sector. Accelerate these processes by using active legal, institutional, organizational and financial measures.
- Provide reduction of energy and overall deficit in Republic of Srpska.
- Create conditions for gradual opening of energy market and investment in energy sector.
- Establish an efficient system of energy efficiency stimulation and use of renewable energy sources in accordance with set goals and obligations that will arise from the membership of Bosnia and Herzegovina in European Union.
- Ensure sustainable development of energy sector in conditions of limited emission of greenhouse gases.
- Legislative alignment with the *acquis* of the European Union.

### **3. DEMOGRAPHIC AND ECONOMIC DEVELOPMENT**

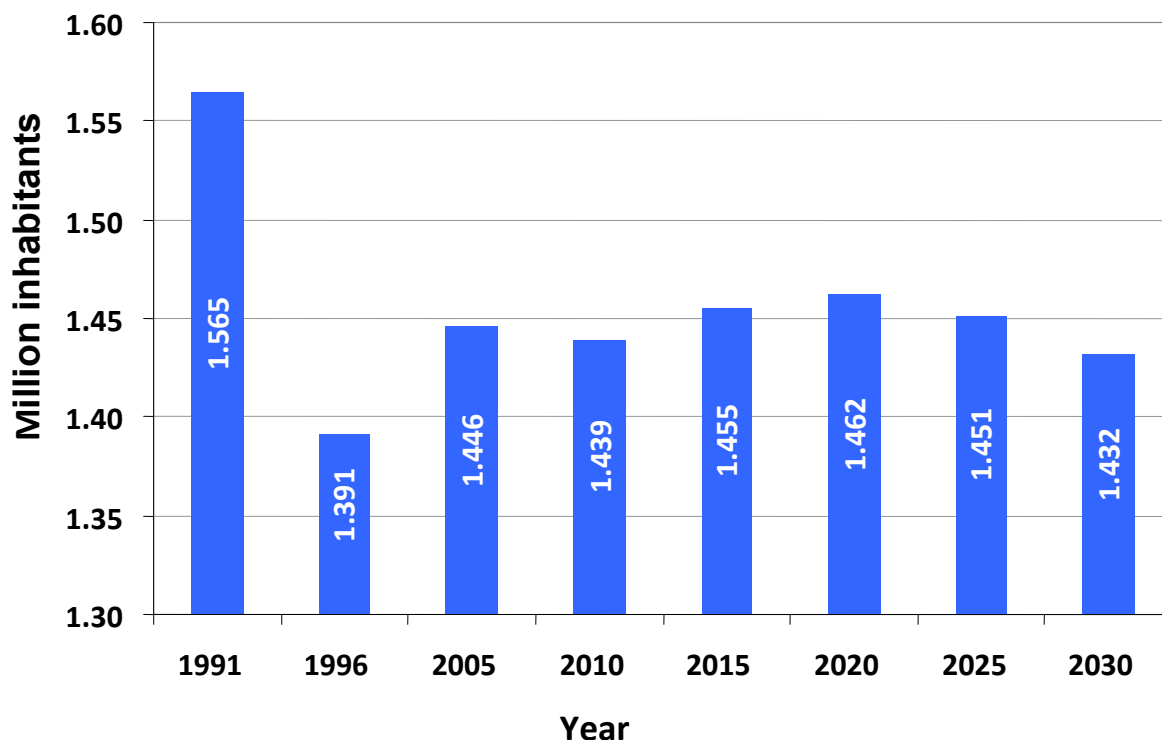
#### **Demographic development**

There are some uncertainties about the total population number in the Republic of Srpska due to the long period without official census. According to the last official census in Bosnia and Herzegovina from 1991, about 1.565 million people or 35.7% of the total population in BIH lived in Republic of Srpska, which makes about 49% of area in BIH.

The list of refugees and displaced people in Republic of Srpska was made during 1996. Based on that list the Republic department for statistics made a formal estimation of the population number, according to which about 1.391 million people lived in Republic of Srpska in 1996 or 11.1% less compared to 1991. New census was not made since 1996. A revision of population number estimation for the period from 2002 until 2007 was made based on the available demographic indicators. It was estimated that the population number slightly decreased in that period due to the negative natural increase.

According to surveys conducted by Republic department for statistics and surveys of other organizations, the population number estimations in period from 2004 until 2007 are between 1.264 and 1.109 million. The survey results show relatively high variations, mutually and in relation to official estimations, but also indicate certain tendencies and the need for determination of reliable population number in the area of Republic of Srpska.

In order to create scenarios and calculate development indicators, the starting point was population number estimation that was made by the Republic department for statistics until 2030, shown below - Figure 1.



**Figure 1. Estimation of population number in Republic of Srpska by 2030**

Having in mind the various estimations of population number in the Republic of Srpska (The Strategy of reform of pension system in Republic of Srpska; demographic estimations in the framework of creating Strategy of development of Republic of Srpska until 2015), the model used the less favorable variant in which the official statistic estimation was decreased for about 18% in the observed years.

### **Economic development**

The economy transition process in Bosnia and Herzegovina and Republic of Srpska started in early 90's of the last century. That process continues today. The adoption of EU standards in all segments of society is present in political, economic and social aspects.

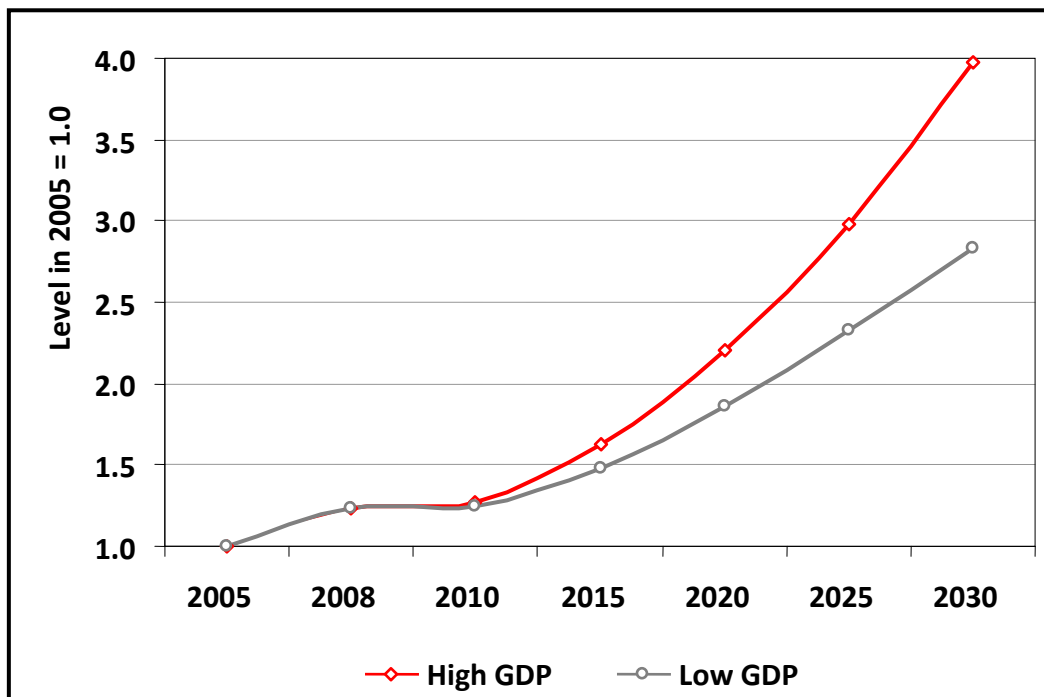
Significant change in the structure of economy of Republic of Srpska has occurred in the past fifteen years. The most propulsive parts of economy, especially industry, stopped working and attractive industry programs and technologies were lost.

Successful privatization of parts of telecommunications and oil industry and the openness of the Republic of Srpska for foreign investments have launched many projects. Within Bosnia and Herzegovina, Republic of Srpska has attracted many foreign investments. Compared to neighboring countries and the countries of the last EU enlargement, there is still space for increase of specific investments per capita in Republic of Srpska.

The future development of Republic of Srpska is analyzed in two scenarios (Figure 2) of gross domestic product (GDP) growth:

- higher growth of GDP – higher scenario assumes overcoming economic crisis in the world and return of Republic of Srpska to high rates of GDP growth – in average of 5.9% annually in the period by 2030,
- lower growth of GDP – lower scenario assumes extension of the global economic crisis and generally slower growth of world economy in the coming decade. However, in this case also Republic of Srpska has to keep relatively high growth rates of GDP – in average of 4.2% annually in the period by 2030.

According to the higher scenario the GDP per capita would reach the level of 14.4% by the year 2015 compared to the average of EU-27. By the year 2030 the reached level would be 23.4% of the average of EU-27. According to the lower scenario the level of one fifth of the EU-27 average would not be reached even by 2030. In both scenarios the GDP indicator per capita is calculated based on the official population number estimation in Republic of Srpska. Assuming that today's population number is for ten percent lower compared to the official estimation, the listed reached levels of GDP per capita are correspondingly higher, and the period for reaching the average of EU-27 is shorter for five years.



**Figure 2. Growth rate of GDP of Republic of Srpska in period 2005-2030 for higher and lower scenario of GDP growth**

The growth of GDP according to the higher scenario (four times higher GDP in 2030 compared to the year 2005) in the next twenty years would provide rapid decrease of current level of unemployment which amounts over 20%. Assuming that the most of the growth results from the increase in labor productivity, technological advances and changes in economy structure (60% of the growth), then enough space remains for employment growth (40%). The number of employees would increase from 252 thousands in 2009 to about 400 thousands in 2030. With that quota the employment rate of working-age population would amount 40% in 2030, which is still significantly less compared to the targets of EU-27 for the year 2010 which amounts 70%. According to the lower scenario (2.8 times higher GDP in 2030 compared to the

year 2005) the number of employed people would rise to 354 thousands, which corresponds to the number of employed people in the area of Republic of Srpska in 1990.

In accordance with the projected level of production, gross domestic product, employment and labor productivity, the other economic effects would also rise – investments, foreign trade exchange, allocation for science, education, technological development, etc.

## 4. CURRENT STATE OF THE ENERGY SECTOR

Analysis of the current state and characteristics of energy sector in Republic of Srpska are the starting point for consideration of future energy needs, possibilities and options for meeting those needs, defining targets and measures for achieving goals of energy sector development in Republic of Srpska.

### Energy consumption and energy supply

Total energy needs in Republic of Srpska are met by consumption of coal, liquid fuels, gaseous fuels, hydro energy and firewood. In period between 2000 and 2005 total energy consumption in Republic of Srpska grew with an average annual rate of 1.3%. The largest share in total energy consumption has coal – about 40%. Firewood also has significant role in supplying energy consumers with a share of about 20%. The share of liquid fuels is about 30%. The share of hydro energy is about 10%, while the share of other energy forms in total consumption is very small.

In period between 2000 and 2005 the final energy consumption in Republic of Srpska grew with an average annual rate of 3%. Electricity, liquid fuels and firewood are the most important energy forms in supply of final consumers. Firewood has the greatest share in final energy consumption – about 35%, which is used for heating in households. The share of electricity in final consumption is about 19%, and the share of liquid fuels is about 30%. The remaining needs are met by coal, gaseous fuels and heat energy.

The share of industry in total final energy consumption in the period 2000-2005 has changed within wide limits from 12% to 24%. Shares of other sectors in final energy consumption in this period were not significantly changed. So the share of transport is about 21%, of households about 50%, services 5% and agriculture about 2.5%

Total energy consumption in the RS is provided by domestic production, import and in a very small part by the supply from the Federation of Bosnia and Herzegovina. Certain amounts of energy, primarily in the form of coal, electricity and liquid fuels, are exported or delivered to the Federation BIH. Own supply of total primary energy increased from about 70% in 2000 to 75.9% in 2005. Own supply of coal is greater than 100% which means that the coal production exceeds consumption. Also, the electricity production is much higher than consumption and the own supply of this energy source in some years ranges from 131% to almost 150%. Total consumption of natural gas is provided by imports. In the market of liquid fuels situation has changed significantly by the beginning of production in the Brod Refinery. Crude oil is fully imported.

### *The energy intensity*

In the period since 2000 to 2005 the energy intensity of total energy consumption was reduced by 18.2%, while the intensity of final energy consumption decreased by 10.8%. Compared to the average energy intensity in the EU-27, the energy intensity of total energy consumption in RS is higher for 87.2%. Comparing the intensity of electricity consumption in the RS with the intensity in EU-27, the same relation is valid.

In the period from 2000 to 2005 the specific energy consumption and specific electricity consumption per capita in RS increased at all levels. Compared to the average total energy consumption per capita in EU-27, that size in RS was smaller for 66.2%.

## Energy reserves and potentials

Republic of Srpska has natural resources for generation and supply of energy. The most important natural resources that are nowadays in use for energy production and supply are:

- coal,
- water streams,
- biomass.

In addition to these resources, Republic of Srpska also has:

- geological reserves of crude oil,
- geothermal sources,
- wind energy,
- solar energy.

### *Coal*

Reserves of brown coal and lignite are distributed in seven major coal basins: Gacko, Ugljevik, Stanari, Miljevina, Kotor Varoš, Lješljani and Ramići. There are other sites with fewer reserves which are not interesting from the standpoint of energy use and/or which are abandoned due to unfavorable exploitation conditions. The total balance reserves amount 684 million tons, of which 390 million tons of lignite and 294 million tons of brown coal. Total exploitation coal reserves amount 578 million tons, of which 353 million tons of lignite and 225 million tons of brown coal. Coal is mainly used for electricity production in thermal power plants (over 90%) while the rest is used for other commercial purposes.

### *Crude oil*

Based on the current level of research of north-eastern BIH, it is considered that there are reserves of crude oil in four priority areas:

- Posavina-1 - in the surface area of 22 km<sup>2</sup> in territory south of Bosanski Šamac; estimation of reserves amounts 64.5 million barrels (about 9.2 million tons);
- Posavina-2 - in the surface area of 14.5 km<sup>2</sup> in territory southwest of Orašje; reserves are estimated at 42.5 to 108.4 million barrels (about 6.1-15.5 million tons);
- Tuzla basin covers a wider area from Zavid and Rožanj, through Požarnica, Simin Han, Jala valley and Tinja valley, with the total surface area of 25.5 km<sup>2</sup>; estimations of reserves amount 99.8 million barrels (about 14.3 million tons);
- Lopar basin covers wider area of Lopar depression with surface area of about 21 km<sup>2</sup>; reserves are estimated to about 83.2 million barrels (about 11.9 million tons).

Estimated reserves at these four sites, which are marked as perspective in terms of finding oil, amount about 355 million barrels or about 50 million tons of crude oil. In addition to specified priority perspective areas, several smaller areas in northeast Bosnia are isolated for further researches after obtaining positive results in four listed areas. Results of researches conducted so far indicate the prospects in terms of existence of oil and gas reserves and justify further researches and point the realistic possibilities of finding commercial deposits.

### *Energy of water streams*

Republic of Srpska is among the areas rich in hydro energy potential. The total technically exploitable hydro energy potential of Republic of Srpska amounts about 3200 MW of installed

capacity and 9500 GWh/year of average annual electricity production. About 2420 GWh/year of this potential is used. Energy potential of locations with predictable installed capacity below 0.5 MW (micro and mini hydro power plants) is not explored in details in Republic of Srpska.

### *Biomass energy*

The total theoretical potential of biomass in the Republic of Srpska is estimated at 31.08-46.24 PJ. The largest part (59%) is biomass suitable for the combustion (waste from the timber industry, firewood, wood waste, pruning residues of perennial crops). Then follows biomass suitable for production of biogas from municipal waste, cattle breeding and energy crops (39%). The current consumption of biomass for combustion is 16.9 PJ or about 92% of the potential of that sort of biomass recorded from sources in area of Republic of Srpska. Further increase of the utilization of wood biomass for energy needs requires increase in efficiency of furnaces and wood boilers and/or transfer to more efficient forms of modern biomass (e.g. pellets).

### *Geothermal energy*

The northern part of the RS has significant geothermal potentials, while the southern and south-east have considerably less potentials. The average expected temperature of geothermal waters in reservoirs is 100°C (80-150°C). Thermal water is nowadays used primarily for balneological purposes, while the energy utilization of geothermal energy for space heating is developed in a limited manner.

### *Wind energy*

For the Republic of Srpska the model wind atlas was made which is necessary to verify by measurements of wind. The most promising area for the construction of wind power plants is the south of Republic of Srpska in territory from Kalinovik to Trebinje. The theoretically exploitable potential for the use of wind energy is estimated at 640 MW and 1200 GWh/year. Technically exploitable potential depends on the conditions of each micro-location (location access and availability of infrastructure) and possibilities of connecting to electric power system. Wind energy is not used for energy purposes nowadays in the Republic of Srpska.

### *Solar energy*

Solar energy is free and practically available everywhere. Preliminary analyzes show that the Republic of Srpska has a significant potential for using solar energy and it is necessary to make a local atlas of the solar radiation. The lowest solar potential is available in the northern regions (1.25 to 1.3 MWh/m<sup>2</sup> of total solar irradiation). The intensity increases by lowering to the south (1.50 to 1.55 MWh/m<sup>2</sup>). The main possible applications are space heating and hot water preparation and electricity production. Solar systems are not in wider use because the equipment for use of solar energy is among most expensive energy technologies and to the lack of incentives for their use.

## **Energy capacities**

### *Coal*

Currently coal is exploited in RS at four locations - Gacko (lignite), Ugljevik (brown), Stanari (lignite) and Miljevina (brown).

Mines Gacko and Ugljevik produce coal for needs of thermal power plants (98% of placements) and for public consumption. Capacity of the Gacko mine is 2.1 million and capacity of Ugljevik mine is 1.75 million tons of coal annually.

To the location of Stanari, in which coal for thermal power plants (sales in FBiH, 45% of placements) and for public consumption is currently produced, was given a concession to build a thermal power plant. Stanari mine has a capacity of 600 000 tons annually. It is planned to increase capacity to a total of 2.8 million tons of coal annually to supply future thermal power plant.

### *Electricity – production*

There are four hydro power plants in the area of Republic of Srpska (HPP Višegrad, HPP Trebinje I, HPP Trebinje II and HPP Bočac), two coal-fired thermal power plants (TPP Gacko and TPP Ugljevik) and several small hydro power plants. HPP Dubrovnik is located on the territory of Croatia and uses water of catchment area Trebišnjica. Production of this plant is currently divided between Elektroprivreda RS (Power utility of RS) and Hrvatska elektroprivreda (Power utility of Croatia) in ratio 50:50. As in other joint ventures in the past, in this case there are certain questions about the allocation of energy, which will be addressed in the following period.

The total available capacity of hydro power plants (including small HPP) is 736 MW, with expected annual production of 2420 GWh. The total installed capacity of thermal power plants in the RS is 600 MW. Available net capacity is 481 MW with an estimated annual production of about 3000 GWh. Thermal power plants are in operation for 25 years and their revitalization is necessary with the aim to extend operation life, improve the technical and economic characteristics and meet environmental regulations. Electricity production fully meets the electricity demand in the territory of RS, while the surplus is being sold to other systems.

### *Electricity– transmission*

Transmission network in RS consists of lines of voltage levels 400 kV, 220 kV and 110 kV. The total length of all transmission lines within the power system of RS is 2395 km, which amounts to about 38% of the total length of all transmission lines within BiH.

The network of the highest voltage level is built satisfactorily and connected in a loop on the BiH territory, and strongly connected to the neighboring systems (Serbia, Montenegro, Croatia). Transmission power of 400 kV lines is extremely high and those lines are often loaded below 30% of the maximum permissible value (about 1000 MW by line), which allows a further increase in the transmission using that network in the future (by 2030), and connection of large thermal blocks to the existing infrastructure. BiH borders with its neighbors are not congested on the BiH side, which means that the transmission network supports the market transactions inside, outside and through the power system of BiH.

### *Electricity– distribution*

Electricity distribution is organized into five independent distribution system operators (electric power distribution companies): Elektrokrajina (232 000 customers), Elektro Doboј (88 000 customers), Elektro Bijeljina (100 000 customers), Elektrodistribucija Pale (51 000 customers) and Elektrohercegovina (27 000 customers).

Losses and unregistered consumption of electricity is one of the greatest problems of the distribution network operators in Republic of Srpska.

Indicators of the continuity of electricity supply in the RS are multiple weaker than the usual values in the European systems. Indicators of quality of commercial service are in a number of cases in accordance with European experience.

### *Oil*

There are two refineries in the area of RS: Bosanski Brod Refinery and Modriča Oil Refinery.

Bosanski Brod refinery consists of two separate production series. The new process line, which is finished in 1991, has a capacity of 3.00 million t/yr for processing crude oil. The old process line was built in 1968, and installed capacity for processing crude oil is 1.32 million t/yr. During the war there was significant damage to plant and equipment. The refinery has restarted its work in late 2008.

Modriča oil refinery was established in 1954. By construction and commissioning of the plant for the manufacture of base oils and paraffin in 1980, production in these years reaches the level of 50 000 tons of greases and 70 000 tons of oil base stock.

### *Natural gas*

Republic of Srpska has no own sources of natural gas. Gas is imported from Russia by direction Beregovo - Horgoš - Zvornik. Length of the transportation system for natural gas in RS is 62 km, the diameter of 406.4 mm, pressure 50 bar and the designed capacity of 1 billion m<sup>3</sup> per year. Distribution and retailing of gas exists in two locations: Istočno Sarajevo and Zvornik.

### *District heating systems*

Companies for toplification in Republic of Srpska exist in the following cities: Banja Luka, Prijedor, Doboj, Zvornik, Gradiška, Bosanski Brod, Istočno Sarajevo, Derventa, Čelinac, Bijeljina, Ugljevik, Pale and Sokolac. The nominal installed capacity of heating plants is 466 MWth. Fuel oil, coal, natural gas and biomass in case of Pale (wood waste from saw mills along with coal) are used in heating plants. The situation of system and district heating companies in the RS is very difficult and complex. Heating plants use outdated and inefficient boilers and the urgent revitalization is needed. Heat distribution networks are not well maintained and transmission and distribution losses of heat are high. There are problems in the calculation and charge of services, and low prices make it impossible to have economically viable business operation of companies and sector development.

### *Biomass*

There is a factory in RS for production of biodiesel from rapeseed located in Banja Luka with capacity to 50 000 tons per year. Since January 2009, biodisel started to be used in public bus transport of Banja Luka in small quantities. There are four pellet plants with total capacity of 97 000 tons per year. Pellets are mainly exported.

## **The impact of the energy sector on the environment**

The most important impacts of the energy sector on the environment in the RS are emissions of pollutant materials in air generated during the combustion of fossil fuels.

Other important impacts of the energy sector on the environment are the discharge of pollutants into the water (the impact on surface and groundwater) and land, waste production and noise. These effects are of local or regional character. According to available data in the

last 10 years, no incidents and accidents in the energy sector that had significant environmental consequences have happened in RS.

**All major energy facilities have an environmental permit and are obligated to report authorities about the impacts on the environment.**

The most important problems in thermal power plants are emissions of sulfur dioxide, emissions of nitrogen oxides and particles that are larger than the marginal values determined by the LCP (Large Combustion Plants) Directive. The installation of desulphurization systems is required, as well as the application of measures to reduce emissions of nitrogen oxides and the reconstruction of electrostatic filters. Apart from these measures, other measures are planned or are underway, such as: the introduction of system environmental management and control of production facilities impact on the environment with the use of modern, preventive and corrective measures to eliminate adverse impacts.

Particularly important impacts among other large energy facilities are impacts of mines in terms of waste management, water management and the need for land reclamation in excavations, and the effects of petroleum refinery and oil refinery. Significant impacts of hydro power plants on the environment are those that occur during the construction of hydro power facilities, and which usually include changes in space, changes in habitats of plant and animal species, the hydrological characteristics of surface and groundwater, and others. Systems of quality management ISO 9001 and environmental management ISO 14001 have been introduced or are in the process of introducing in the hydro power plants.

Total emission of carbon dioxide from all stationary and mobile energy sources in area of BIH in 1990 amounted to around 24.9 million tons. It is estimated that the CO<sub>2</sub> emission in the RS in 1990 amounted about 8.1 million tons. Total emission of carbon dioxide in 2005 in the RS was 4.5 million tons or 32.3% of total emissions in BIH.

### **The legal framework**

- The energy sector, according to the constitution of BIH and entity constitutions, is in the responsibility of the entity. However, some of the activities were transferred by special agreements to the level of BIH, which, according to current practice, does not function as expected.

Laws and bylaw acts for the energy sector (at the level of the RS and BIH) were used to establish legislative and institutional framework for restructuring the energy sector, opening of energy market, regulation of energy activities, determination of market rules, public service obligation and the separation of energy activities.

**Adjustment with the relevant EU directives in the field of electricity, gas, oil and oil products is mostly done by legal resolutions.**

In terms of renewable energy sources, cogeneration and energy efficiency it is expected to adopt bylaw regulation for stimulating use of renewable energy sources, cogeneration and energy efficiency.

Further ensure of full market opening, preventing distortion of the market, developing and promoting the use of renewable energy, energy efficiency and environmental protection requires strict enforcement of existing legislation. In addition, it is necessary to monitor and accept new requests and recommendations of the European Commission, bearing in mind the specifics of the domestic market and the need to ensure economic development of RS.

**A legal framework for concessions granting has been established, which, among other things includes concessions for existing and new energy facilities. The field of public-private partnership (PPP) that can be applied to the construction of energy facilities is also regulated.**

### **Prices of energy and energy sources**

Prices of energy and energy sources in the RS are free and regulated. The prices of services for the activities of natural monopolies are regulated (transmission/transportation and distribution of network energy and energy sources) and supply of tariff customers.

Prices of petroleum products are formed in accordance with market conditions. The average price of EURO diesel and BMB 95 petrol in the RS is slightly below the average for the region of south-eastern Europe, but higher than the EU-10 (the 10 countries that together joined the EU in 2004).

Regulatory commission for energy sector of RS determines tariff rates for the sale of electricity for tariff customers and gives consent to energy subjects on prices of natural gas supply.

**Consumers in RS pay a lower price of electricity compared to the average realized price in the region of southeast Europe. Industrial consumers in RS pay 34%, households 8.3% and service sector 3.9% lower price than the average price in region. In relation to the level of price in EU-27, the average electricity price in RS is lower for about 35%. There is a cross-subsidy between different categories of customers in the electricity sector of the RS.**

**Consumers of natural gas in the RS pay the highest price of gas in the region of southeast Europe. Price for consumers in RS is 33.8% higher than the average price for the region and 18% higher than the average in EU-27.**

Coal prices are formed on the free market principles, i.e. they are not a subject of special regulations. In the part related to the coal price for electricity production, the costs are approved by regulatory commission.

There is no single regulatory framework for the pricing of heating in the district heating sector and the prices are determined at the level of municipalities. Temporary decisions on prices for the upcoming heating season are brought. Local authorities are, during the process of making decisions on prices, often guided by social motives and they allocate resources from the budgets of local communities to assist companies to provide heating for the upcoming season.

Prices of firewood in RS are determined by Public forestry company "*Šume Republike Srpske*". Prices for this energy source are determined on the basis of their own calculations and the state in the sector. Pricing of wood is affected by irregularities and illegality in the forestry sector, the appearance of abuse, theft and illegal logging, the existence of private forests and the impact of the situation in the forestry sector in the Federation of BIH. During 2008 and 2009 the prices of firewood determined by the public company and prices on the open market have coincided.

## International obligations

The most important international agreements that affect the energy sector to which BIH and thus the RS has approached, are the CEFTA agreement, Energy Charter Treaty, The Treaty on establishing Energy Community, The Stabilization and Association Agreement and the international agreements on environmental protection (LRTAP, UNFCCC, biodiversity, environmental impact assessment, etc.).

It is predicted by some agreements to adopt the legal heritage of the European Union in the field of energy sector, especially of so called second EU liberalization package for electricity and natural gas, the directive on security of supply, promoting development of renewable energy sources, environmental protection, market bid and competition.

## Ownership of the energy sector

Ownership of the energy sector in RS is public and private.

MH Elektroprivreda RS from Trebinje is a holding company owned by the Government of the RS. There are eleven stock companies operating in holding (five for production and five for the distribution of electricity and electrical engineering research and development center (*IRCE Istraživačko razvojni centar elektroenergetike*)) in which the parent company owns 65% of shares (except in IRCE where it owns 51%). Co-owners of stock companies are investment funds, funds of RS and RS citizens. Coal mines are integrated in the mining and energy complexes of mine-thermal power plant. Elektroprivreda RS is the owner of the distribution network.

The company for electricity transmission (Elektroprenos BIH, Banja Luka) is in the joint public ownership of Federation BIH (58.89%) and RS (41.11%). Independent system operator (*NOS BIH*, Sarajevo) is owned by the Federation BIH and the Republic of Srpska. There is also a State electricity regulatory commission (*DERK - Državna regulatorna komisija za električnu energiju*) at the state level. The State electricity regulatory commission (*DERK*) is an independent and nonprofit institution of Bosnia and Herzegovina, which has jurisdiction over the transmission of electricity, transmission system operations and international trade of electricity.

A few concessions for the exploitation of energy potential of coal and water streams have been granted to private companies. The most important concessions are for the exploitation of coal and construction of a thermal power plant in mine Stanari (EFT Group) and in coal basin Kotor Varoš for the construction of heating plant on coal and municipal and wood waste (Eko Green Energo), for the utilization of the Neretva water stream – HPP Ulog (EFT Group), for utilization of Vrbas water stream - HPP Banja Luka Niska and HPP Krupa (HES Vrbas owned by Viadukt-Portorož and Gređevinar-Kraljevo) and for the construction of small hydro power plants (greater number of concessioners).

Refinery A.D. Bosanski Brod, Modriča oil refinery and distribution network Petrol Banja Luka were privatized in May 2007. Russian company NjefteGazinKor, which is part of the Russian state company Zarubežnjeft, bought 80% share of ownership in the Refinery AD Bosanski Brod, 75.6% of Modriča oil refinery and 80% share in Petrol Banja Luka. The new owner has undertaken to invest 280 million Euros in the period by 2010 in modernization of Refinery in Bosanski Brod, Bosanski Brod-Modriča railway construction, modernization of distribution network Petrol Banja Luka and modernization of Modriča oil refinery.

In the toplification sector companies for the production and distribution of heat are owned by municipalities.

The natural gas sector in RS involves three parties: AD Sarajevo Gas, Istočno Sarajevo - for gas transportation and distribution (manages the transmission route Zvornik-Kladanj and performs distribution and supply of natural gas in municipality Istočno Sarajevo, the joint ownership), AD Gas promet, Istočno Sarajevo - Pale for import, supply and transportation of gas (manages the transmission route Karakaj-Zvornik, currently under the joint ownership – resolving of property-law issues, status issues and capital investments with Srbijagas are currently present) and Zvornik-Stan-Zvornik for distribution and supply of natural gas (owned by local community). The holder of the contract on gas import, which was concluded with the Russian Gaseksport, is the company Energoinvest Inc. in joint ownership.

### **Energy efficiency and renewable energy sources**

The use of renewable energy sources and efficient cogeneration are of general interest for the Republic of Srpska. There is no incentive system for use of renewable energy sources and increase of energy efficiency. Legal framework envisages the basic structure of this system for which drafts of necessary legislation are made and whose regulation is under the jurisdiction of the Energy regulatory commission of RS, and with the consent of the Government of the RS.

### **The institutional framework of planning and regulation in energy sector**

Energy policy and planning of energy sector development in RS is achieved by the Energy sector development strategy of the Republic of Srpska and by action plans for implementation of the Strategy. Energy sector development strategy is brought by the National assembly of the Republic of Srpska at the proposal of the Government of the RS for a period of 20 years. Energy development strategy is synchronized with the Spatial plan of Republic of Srpska and economic development plans of Republic of Srpska.

Action plans for implementation of the Strategy are issued by the Government of the RS. The action plans set out measures, holders of activities and the terms of realization of energy policy, as well as a way of achieving cooperation with the organs of local self-government in the area of planning energy sector development and cooperation with energy subjects in the sector of electricity, gas and oil, other entities in Bosnia and Herzegovina and international institutions.

The RS Government adopts an annual energy balance, and the ministry responsible for energy sector adopts an ordinance on the energy balance creation.

Regulatory commission (*RERS*) is an independent and nonprofit organization, which is functionally independent from republic bodies, energy entities and users of their products and services, as well as of all other legal and natural persons. The role and importance of the Energy sector regulatory commission of Republic Srpska are in ensuring competitiveness and energy market development. Regulatory commission regulates and supervises relations in market of electricity, gas and oil, taking into account providing the principle of transparency, non-discrimination, fairness, encouraging competition and protecting the final consumers.

RS Commission for concessions is a permanent, independent regulatory legal entity for performing functions of concession granting. In general terms, to carry out economic activity in the energy sector a concession is required if the matter of use are natural resources, goods in general use and performance of activities of general interest. The decision on granting a concession issues Government of RS at the Commission proposal.

## **Energy market**

Market of oil and oil products in RS is completely open and free. In the past 15 years, this market has largely depended on imported oil products. With the beginning of the Bosanski Brod refinery operation in late 2008 the market is largely supplied by domestic production. In the market of oil products of Republic of Srpska there are a very large number of economic entities that import oil products. Regarding the number of transport users, retail network and distribution of oil products is very fragmented. It can be concluded that the number of petrol stations is too high, as indicated by the operation of a certain number of petrol stations on the verge of profitability, and some are closing. In the past few years several private companies have been developed which in their structure have a greater number of petrol pumps and significant participation in the wholesale.

In the markets of coal and firewood there are no barriers for free trade.

The market of district heating as a network energy source is not regulated in terms of granting concessions, licenses, tariff systems, technical regulations, etc.

The markets of electricity and natural gas were formally opened (1<sup>st</sup> January 2008 for all customers except for the category of households), but for now only the wholesale electricity market is active. So far no customer has changed supplier, which is explained primarily by low electricity prices and the lack of options (for natural gas there is only one importer of gas). The separation of distribution network operator and supply function in electricity has not been carried out yet and the change of supplier has not been tried out in practice. According to the Treaty on establishing the Energy Community, all customers of electricity and natural gas shall have the status of favored buyers from January 1<sup>st</sup> 2015. From that day the functions of distribution network operator and supply will be differentiated.

## 5. ENERGY SECTOR AS AN ELEMENT OF ECONOMIC DEVELOPMENT

In economically developed countries the energy sector has the function of the infrastructure that enables and supports economy development and general living standard. The share of energy costs in the companies' costs and in costs of the citizens' lives is relatively low. Significantly higher impact of energy sector is in terms of production of energy equipment and devices, i.e. in the process of creating additional value by selling final products in domestic and foreign market.

In societies with economies in transition, as in the case of Republic of Srpska, the direct impact of energy sector on economic development is significant (investments in new energy facilities, energy sale), the share of energy costs in total living costs can be significant, and problem of determining a socially acceptable energy costs occurs.

**Given the period that Strategy processes, the impact of energy sector on the development of Republic of Srpska can be divided in two periods:**

- **in the first period that includes the next 10 to 15 years, the energy sector will, besides the infrastructure that supports economic development and overall growth of living standard, have a dimension of creating additional value because there is potential for energy sale on the international markets,**
- **in the second period, for which the inclusion in the European Union is characteristic, the energy sector will gradually receive the primary infrastructure role.**

The ultimate impact of energy sector on economic development of Republic of Srpska will primarily depend on the possibility for participation of domestic industry and other economic industries in the construction and exploitation of energy facilities. Minimum impacts and minimum additional value are achieved in a situation where the primary energy source is domestic, while the other elements and phases rely on import (equipment, specialized labor, etc.). In this sense, the development of energy sector should be accompanied by appropriate programs and measures for the development of industry and service sector.

The period covered by the Strategy is the period of new restrictions on greenhouse gas emissions. Expected consequences of this limitation are increasing energy prices, with direct impact on the economy and living standard. At the same time this will encourage greater investments in research, development and utilization of renewable energy sources and energy efficiency, which brings new opportunities for business activities.

## 6. SCENARIOS OF ENERGY SECTOR DEVELOPMENT

Energy strategy of Republic of Srpska observes three development scenarios:

**S1 – Higher GDP growth - a fundamental feature of this scenario is the rapid growth of gross domestic product (desirable scenario of economic development), use of conventional technologies without active authority measures.**

**S2 – Higher GDP growth with measures - a fundamental feature of this scenario is the rapid growth of gross domestic product with the implementation of energy efficiency measures and stimulation of the use of renewable energy sources.**

**S3 – Lower GDP growth - a fundamental feature of this scenario is the slow growth of gross domestic product and the use of conventional technologies without active authority measures.**

### **S1 – Higher GDP growth**

The main generator of economic growth in the Republic of Srpska is industry, which will rapidly catch up with competitors in the domestic and regional markets. This dynamic development will be enabled by modern technologies and new industrial processes. The result is several times slower growth in energy consumption in industry compared to the simultaneous economic growth of industry.

With the development of industrial production, the cargo transport is also growing. With higher living standard the number of private cars will double. Despite the expected significant reduction in specific fuel consumption of road vehicles, the total energy consumption in transport will be doubled. Despite the stagnation of population number, number of housing units will rise and migration to urban centers will continue. All new buildings shall be made according to regulations which over time set up more strict requirements on the thermal losses.

Although household appliances and air conditioners are more efficient, electricity consumption per household is growing due to increased availability of these devices. The growth of electricity consumption in households is, on the other hand, slowed down by substitution of electricity consumption for heating, cooking and hot water preparation by natural gas.

**The network of natural gas is growing rapidly and 20% of households in Republic of Srpska will be connected to it by 2030. Firewood remains the main source of energy in households, but from today's 75%, the share of firewood in heating of households will decrease below 50%.**

The service sector is growing rapidly and increases its surface area over two times. Because of today's low intensity of energy consumption in this sector energy consumption is growing over three times.

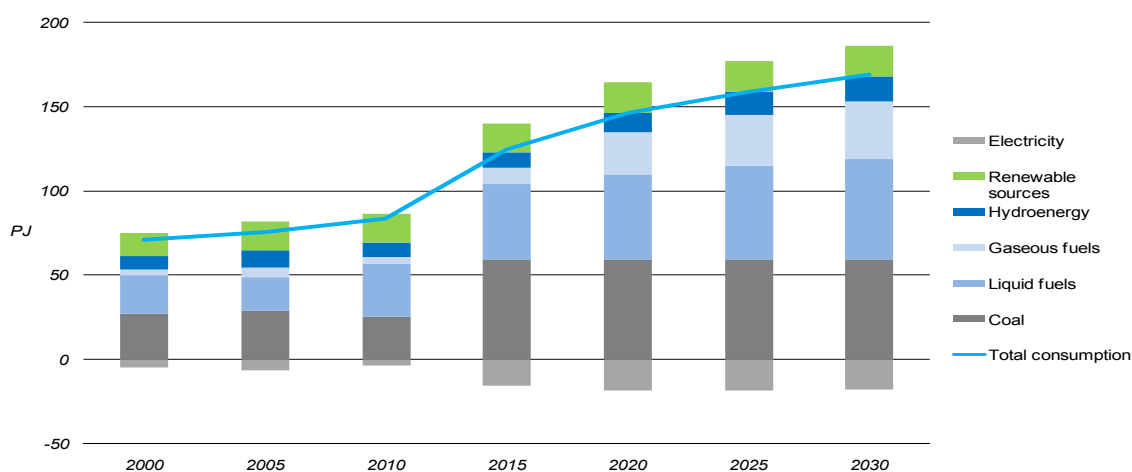
**With GDP growth of four times, compared to the level in 2005, the total final energy consumption in this scenario will increase only twice.**

The highest growth rate of final energy consumption in the scenario S1 will be in the period 2010–2015 and 2015–2020 (3.4% and 3.7%). Gaseous fuels have the highest growth rate (Table 1) in the period 2010–2015 (12.8%). The expected shares in final energy consumption in the scenario S1 in 2030 are as follows: liquid fuels (36.0%), electricity (22.0%), gaseous fuels (20.3%) and renewable sources (17.4%).

**Table 1. Final energy consumption in scenario S1**

	2000	2005	2010	2015	2020	2025	2030	2005-10	2010-15	2015-20	2020-25	2025-30
	PJ							%				
Coal	0.41	0.46	0.51	0.63	0.81	0.90	0.94	2.2	4.1	5.4	2.2	0.9
Liquid fuels	16.13	15.67	19.22	22.81	26.91	30.79	34.21	4.2	3.5	3.4	2.7	2.1
Gaseous fuels	3.50	6.09	3.75	6.85	11.02	15.23	19.30	-9.2	12.8	10.0	6.7	4.8
Renewable sources	13.94	16.72	16.73	16.70	17.13	17.10	16.54	0.0	0.0	0.5	0.0	-0.7
Electricity	7.79	9.50	10.73	12.96	15.95	18.36	20.87	2.5	3.9	4.2	2.9	2.6
Heat	0.96	1.20	1.76	2.24	2.58	2.88	3.05	8.0	4.9	2.9	2.3	1.1
<b>Total</b>	<b>42.72</b>	<b>49.64</b>	<b>52.71</b>	<b>62.19</b>	<b>74.40</b>	<b>85.27</b>	<b>94.91</b>	<b>1.2</b>	<b>3.4</b>	<b>3.7</b>	<b>2.8</b>	<b>2.2</b>

The greatest increase in consumption of total energy needed in scenario S1 will be in the period 2010–2015 (8.4%) and lowest in the period 2025–2030 (1.3%). At the end of the observed period liquid fuels and coal will have the largest shares in consumption (35.3% and 35.1%). Electricity is exported. Total energy demand by energy sources in the scenario S1 is shown in the following figure (Figure 3).



**Figure 3. Total energy consumption by energy sources in scenario S1**

## S2 – Higher GDP growth with measures

In scenario S2, the introduction of measures to increase energy efficiency and greater use of renewable energy sources, intervention and authority activity will be used to build the institutional and organizational framework, which will enable additional energy effects in the entire energy system, as well as in industry. This implies the formation of economically viable energy prices, which then open space to companies for energy savings ESCO (Energy Service

Companies) to further operate on commercial decrease in consumption of electricity and other energy sources. Assumed framework provides the ability for industry companies to involve themselves in activities of energy efficiency improvements, with the help and the organization of energy agencies. In the case of forming special instruments and organizations, such as fund for energy efficiency and renewable energy sources, these effects can be even higher.

In the industry model these improvements are anticipated through reduced energy intensity of consumption of non-heat electricity and useful heat energy, increase of efficiency in technologies for heat production, increase of cogeneration in production of heat and electricity, with a biomass planned as fuel, and the use of solar energy in the food industry.

Special measures will be used to stimulate the purchase of more efficient private cars, and discourage purchase of poor and elderly. The transport policy will encourage public transport, especially in cities, greater use of railways, and greater use of gas and electricity in transportation. Such orientation is assumed in the scenario S1, and in S2 scenario is increased. The share of private cars on liquefied petroleum gas and intense substitution of diesel buses with buses using compressed natural gas will be increased. In comparison to scenario S1 the presence of biodiesel is greater. By 2030 these measures will cause the reduction in energy consumption in transport by 10%.

Most of the energy consumption in households is used for space heating, and the greatest reduction in energy consumption in households can be achieved by actions to improve the heat insulation. In doing so, there are possibilities to reduce heat losses in new and in existing residential buildings. Heat losses in new buildings can be defined by laws and regulations, and control of regulation compliances is more easily implemented in new residential buildings compared to the newly-built private houses.

**Future reduction of heat losses of the existing housing stock is the most difficult task, but also the greatest potential for energy savings. At the level of Republic of Srpska by 2030 the heat insulation of about 137 000 old residential units would increase for 60% in this scenario, which is 29% of the total housing stock planned for 2030. Since it is expected that new buildings have a share of 24% in total housing stock by that period, it follows that 53% of the housing stock will have significantly better heat insulation.**

By introducing obligatory measuring of the heat consumption in remotely heated old apartments in residential buildings, their heat consumption will be reduced by an additional 30%. It is assumed that by 2030 slightly more than 3% of useful heat for the hot water preparation would be produced using solar collectors. Incentives would be necessary for such high share of solar collectors, and only a small part, which is slightly higher than in scenario S1 would be achieved without using incentives. The use of geothermal energy using heat pumps is also envisaged. It was estimated that by 2030, along with measures of incentives, this, for now still very expensive technology would be applied in several thousand family houses. Very competitive central heating systems for heating by modern biomass (pellets) will cover 5% of the useful heat demand for heating and hot water preparation. Measures to encourage purchase of more efficient household appliances will result in reduced electricity consumption.

**By using specified measures the final consumption in households would decrease by 15% until 2030 compared to the scenario without measures (S1), and in relation to 2005 would grow by only 22%.**

It was estimated that by using the additional measures the heat consumption for space heating in the service sector would reduce to 16.5% compared to the scenario S1 by 2030. By using measures, electricity consumption for non-heating purposes can be reduced to 5%. These results will be achieved by good work organization of energy agencies and using the ESCO

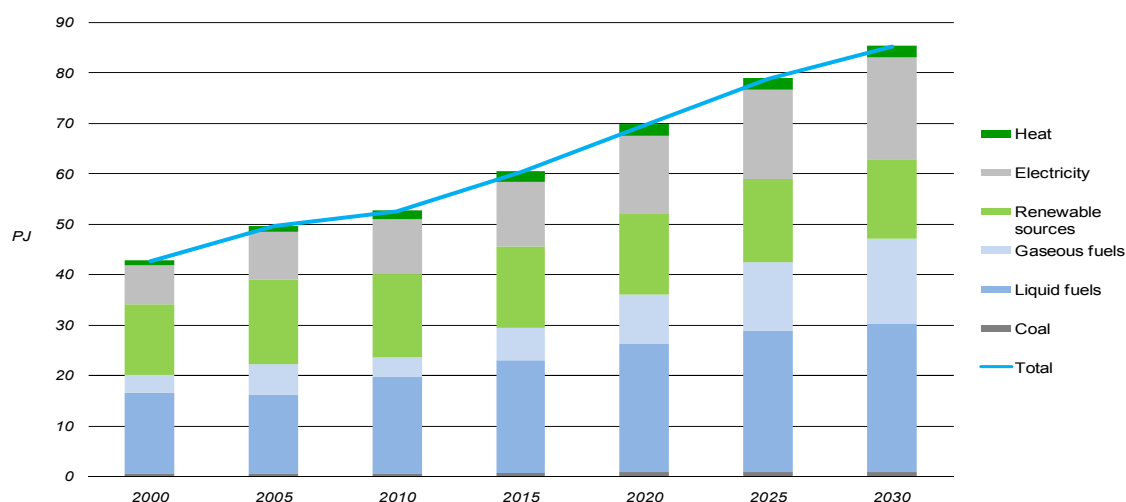
model. By organized measures these results can also be achieved in commercial, and especially in the public service sector. Compared to the baseline scenario, use of solar energy for cooking and hot water preparation in the service sector is increased, amounting 3% of useful needs by 2030. Activities of the agencies and ESCO companies will more quickly increase degree of efficiency in transforming final energy into useful heat energy.

**Estimated final energy consumption in 2030 in scenario S2 (higher GDP with measures) is for 9.8% lower than in scenario S1.**

The highest growth rate of final energy consumption in the scenario S2 will be in the period 2015–2020 (2.9%). The highest growth rate (Table 2, Figure 4) will have gaseous fuels in the period 2010–2015 (11.8%). The largest share in final energy consumption in the scenario S2 in 2030 will have liquid fuels (34.4%), electricity (23.6%), gaseous fuels (19.7%) and renewable sources (18.5%).

**Table 2. Final energy consumption in scenario S2**

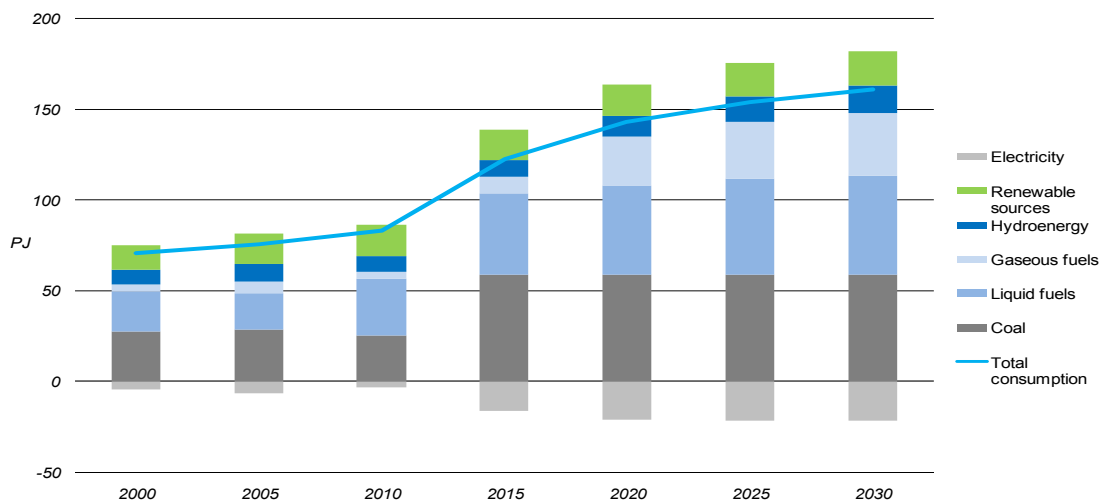
	2000	2005	2010	2015	2020	2025	2030	2005-10	2010-15	2015-20	2020-25	2025-30
	PJ							%				
Coal	0.41	0.46	0.51	0.59	0.76	0.84	0.86	2.1	2.9	5.1	2.0	0.7
Liquid fuels	16.13	15.67	19.21	22.33	25.45	27.95	29.33	4.2	3.1	2.7	1.9	1.0
Gaseous fuels	3.50	6.09	3.76	6.56	9.76	13.71	16.81	-9.2	11.8	8.3	7.0	4.2
Renewable sources	13.94	16.72	16.67	16.09	16.22	16.47	15.80	-0.1	-0.7	0.2	0.3	-0.8
Electricity	7.79	9.50	10.72	12.72	15.34	17.63	20.11	2.4	3.5	3.8	2.8	2.7
Heat	0.96	1.20	1.75	2.15	2.29	2.39	2.38	7.9	4.2	1.2	0.8	-0.1
<b>Total</b>	<b>42.72</b>	<b>49.64</b>	<b>52.62</b>	<b>60.44</b>	<b>69.82</b>	<b>78.97</b>	<b>85.30</b>	<b>1.2</b>	<b>2.8</b>	<b>2.9</b>	<b>2.5</b>	<b>1.6</b>



**Figure 4. Final energy consumption in scenario S2**

The greatest increase in consumption of total energy needed in the scenario S2 will be in the period 2010–2015 (8.1%) and the lowest in the period 2025–2030 (0.9%). Liquid fuels and coal will have the largest shares in consumption (33.8% and 36.7%) at the end of the observed

period. Electricity is exported. Total required energy by energy sources in scenario S2 is shown in the following figure (Figure 5).



**Figure 5. Total energy consumption by energy sources in scenario S2**

### S3 – Lower GDP growth

Increase in total GDP by four times in the period 2005-2030 is envisaged for scenario S1, and in lower S3 scenario this increase is 2.8 times. On the time scale it is a delay of 6 years of the GDP amount in scenario S3 compared to the scenario S1. The same ratio applies to the GDP of the processing industry. Since the amount of GDP is lower, the structural changes in total GDP and GDP in the processing industry are slowed down, or in delay for 5-6 years. In processing industry this means that in planning years the structure of processing industry in lower scenario will be more energy-intensive compared to scenario S1, or that the distribution of the industries of basic materials and consumer goods will be slightly higher.

Slower GDP growth also has impact on energy consumption in transport. By reduced economic activities, the cargo transport is smaller, and by reduced purchasing power of population the passenger transport is smaller. The number of private cars is also smaller, and mileage per year per car. Car fleet is somewhat older, and thus the specific fuel consumption per vehicle is higher. Given that the delay of total GDP in scenario S3 is 6 years, compared to the scenario S1, the change in structure of satisfying the needs in transport is slowed down for the same time period.

As in other consumption sectors, the principle of delayed consumption guidelines (in line with slower GDP growth) is applied in households. This refers to the total number of apartments and their average surface area. Because of the relatively high standard of space heating in the initial year (2005) and less purchasing power, households will have to direct somewhat higher part of their incomes on services, which will over time be increasingly necessary, such as mobility and information technology. The result is that the final energy consumption in households in scenario S3 is in delay for 5-6 years compared to the scenario S1.

**The main feature of the scenario S3 compared to the scenario S1 is slower growth of total GDP. The result is delay in total final energy consumption in the Republic of Srpska in the lower scenario (S3) for 5 years compared to the reference scenario (S1), which is 10% less final energy consumption in 2030.**

The highest growth rate of final energy consumption in the scenario S3 (Table 3) will be in the period 2015–2020 (3.1%). The highest growth rate will have gaseous fuels in the period 2015–2020 (10.2%). The largest share in final energy consumption in the scenario S3 in 2030 will have liquid fuels (35.9%), electricity (21.1%), gaseous fuels (18.5%) and renewable sources (20.5%).

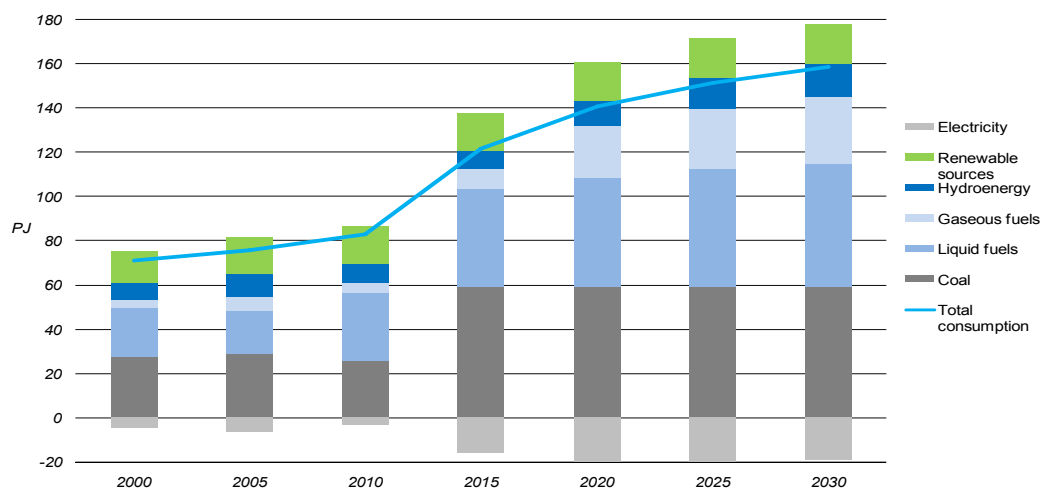
**Table 3. Final energy consumption in scenario S3**

	2000	2005	2010	2015	2020	2025	2030	2005-10	2010-15	2015-20	2020-25	2025-30
	PJ							%				
Coal	0.41	0.46	0.51	0.58	0.76	0.84	0.89	1.9	2.8	5.4	2.2	1.2
Liquid fuels	16.13	15.67	19.11	22.08	25.67	28.66	30.76	4.0	2.9	3.1	2.2	1.4
Gaseous fuels	3.50	6.09	3.68	5.73	9.30	12.62	15.80	-9.6	9.2	10.2	6.3	4.6
Renewable sources	13.94	16.72	16.67	16.65	16.88	17.38	17.50	-0.1	0.0	0.3	0.6	0.1
Electricity	7.79	9.50	10.63	12.23	14.37	16.44	18.01	2.3	2.8	3.3	2.7	1.8
Heat	0.96	1.20	1.75	2.16	2.38	2.56	2.61	7.9	4.2	2.0	1.5	0.4
<b>Total</b>	<b>42.72</b>	<b>49.64</b>	<b>52.35</b>	<b>59.42</b>	<b>69.35</b>	<b>78.51</b>	<b>85.57</b>	<b>1.1</b>	<b>2.6</b>	<b>3.1</b>	<b>2.5</b>	<b>1.7</b>

The greatest increase in consumption of total energy needed in the scenario S3 will be in the period 2010–2015 (8.0%) and the lowest in the period 2025–2030 (1.0%). Liquid fuels and coal will have the largest shares in consumption (35.1% and 37.3%) at the end of the observed period. Electricity is exported. Total required energy by energy sources in scenario S3 is shown in the following table and figure (Table 4 and Figure 6).

**Table 4. Total energy consumption by energy sources in scenario S3**

	2000	2005	2010	2015	2020	2025	2030	2005-10	2010-15	2015-20	2020-25	2025-30
	PJ							%				
Coal	27.42	28.88	25.49	59.14	59.20	59.25	59.21	-2.5	18.3	0.0	0.0	0.0
Liquid fuels	22.45	19.87	31.30	44.25	49.48	53.44	55.70	9.5	7.2	2.3	1.6	0.8
Gaseous fuels	3.57	6.18	3.90	8.71	23.23	27.17	30.61	-8.8	17.4	21.7	3.2	2.4
Hydroenergy	8.05	10.22	8.63	8.71	11.29	13.53	14.22	-3.3	0.2	5.3	3.7	1.0
Renewable sources	13.96	16.74	16.86	17.03	17.44	17.95	18.05	0.1	0.2	0.5	0.6	0.1
Electricity	-4.51	-6.27	-3.32	-16.16	-19.90	-20.01	-19.07	-12.0	37.2	4.2	0.1	-1.0
<b>Total consumption</b>	<b>70.94</b>	<b>75.62</b>	<b>82.86</b>	<b>121.68</b>	<b>140.74</b>	<b>151.33</b>	<b>158.72</b>	<b>1.8</b>	<b>8.0</b>	<b>3.0</b>	<b>1.5</b>	<b>1.0</b>



**Figure 6. Total energy consumption by energy sources in scenario S3**

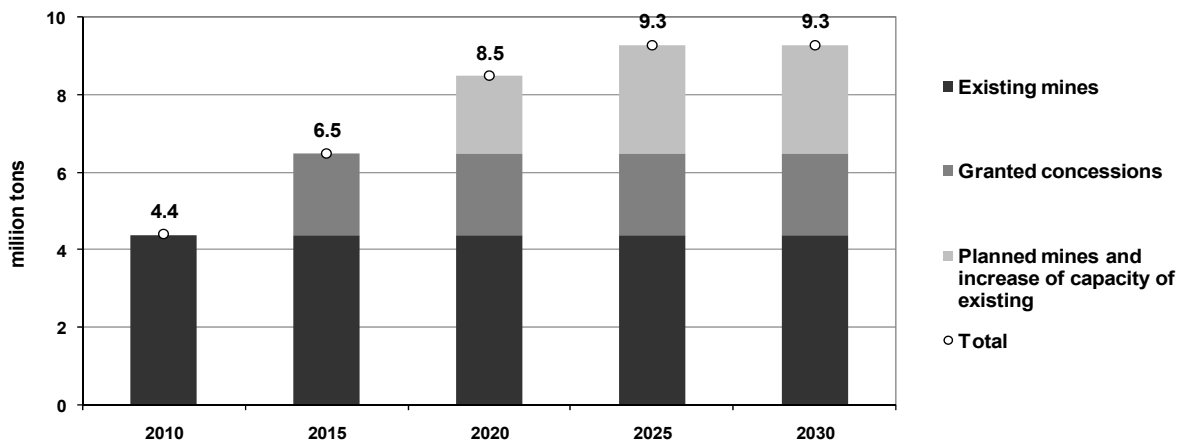
Comparison of three scenarios shows that final energy consumption in the scenario with measures and a high GDP growth rate (S2) in the Republic of Srpska will be almost the same as the final energy consumption in a scenario with lower rate GDP growth rate (S3).

## 7. COAL SECTOR

Coal is the most common energy source currently used in the Republic of Srpska. More than 90% of total coal consumption is related to thermal power plants, while the remainder is used in public consumption (industry, services, households). The reason for the use of coal as an energy source is its distribution and sufficient reserves of satisfactory quality. Reserves on which the coal exploitation will develop are relatively evenly distributed throughout the entire territory of Republic of Srpska, from Lješljani on the west to Gacko on the southeast.

Limiting factors of the coal sector development, both in the Republic of Srpska, and the world, are negative impacts of technologies for extracting and combustion of coal on the environment. Improvements of technologies and ways for coal combustion are obligatory, as well as the combustion products purification and recultivation of degraded areas caused by exploitation. In addition to favorable quantitative and qualitative parameters of coal, important factors for the coal sector development are low price of coal extraction (in relation to competing energy sources - oil and natural gas), local availability (security of supply and reduction of dependence on imports) and the safety of exploitation, especially in the mines with surface exploitation.

Coal is an important energy resource in the entire region of southeastern Europe, and there are plans for new and rehabilitation of existing thermal power capacities which is an indicator that coal continues to be a significant energy source in the region. Increase of coal production and consumption is also expected in Republic of Srpska (Figure 7) in the next period, primarily for electricity generation in thermal power plants. From the current 4.4 million tons, coal production will rise to level between 6.5 and 9.3 million tons annually in 2030, depending on the realization of projects of new thermal power plants and energy plants, as well as future commitments of BiH, and therefore the Republic of Srpska in terms of restrictions on greenhouse gas emissions. If a new block of 300 MW would be built around 2025, then these annual required amounts of coal would be increased for additional 2 million tons and that would be about 11.3 million tons instead of 9.3.



**Figure 7. Coal production in Republic of Srpska by 2030**

Because of the harmful effects of coal combustion of existing thermal power plants Ugljevik and Gacko, activities to reduce emissions of harmful gases have started, particularly sulfur dioxide emissions. New thermal power facilities to be constructed will use modern combustion technologies with a high degree of efficiency and in combination with modern and environmentally friendly systems of co-combustion and control of harmful gases emissions.

The development of the coal sector in the future will be achieved by the realization of the following activities:

- **opening of new surface excavations in locations Gacko and Ugljevik and renewal of mining machinery,**
- **solving the institutional, organizational and problem of financing coal reserves researches and continuation and steady exploration of coal reserves in individual deposits in accordance with legal regulations. In solving the problem of financing the researches of coal reserves, the tendency will be on to models that will not further burden the budget of the RS,**
- **education of professionals for the coal sector,**
- **planning the development of individual coal basins,**
- **compliance with standards and regulations of the environment protection.**

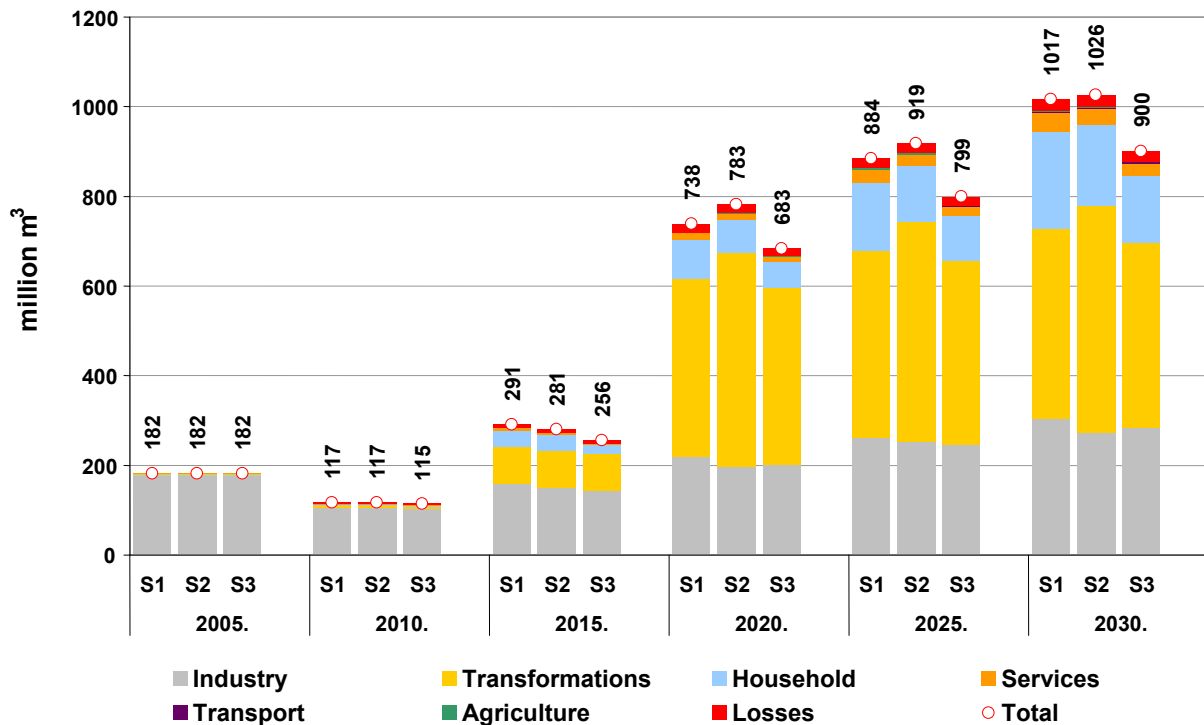
**What is very important for the coal sector is the fact that the existing surface excavations are at the end of the reserves and in the next few years new mines need to be opened and mining machinery needs to be renovated.**

Expected investments in the coal mines in the next 20 years will be at a level of about 600 million BAM. With the eventual construction of the specified block of 300 MW, investments in coal mines would be increased.

## 8. GAS SECTOR

Natural gas market in the Republic of Srpska is limited to a narrow area through which the transportation gas pipeline goes through. Natural gas consumption in RS is low and it was 90 million m<sup>3</sup> in 2008. Industry has the largest share in gas consumption – 94%. Republic of Srpska does not have its own sources of natural gas and the gas supply is fully based on import (Russian gas). Activities on the preparation of oil and gas researches are intensified recently. The result is signing of the concession contract for such researches, which was signed in the spring of 2011.

Given the goal of gasification in Republic of Srpska, increase of natural gas consumption in all development scenarios is expected by 2030. The expected consumption in 2030 is at the level between 0.9 and 1.0 billion m<sup>3</sup> (Figure 8).



**Figure 8. Natural gas consumption in the RS for three development scenarios**

According to scenario S1 (high GDP), the share of industry in total gas consumption in the RS will decrease to 30% in 2030. The share of the transformations will increase to 49%, and the share of households to 18%. Other sectors have much smaller shares. The average annual increase in gas consumption by the year 2030 is 7.2%. Total gas consumption in 2030 according to scenarios S1-High GDP and S2-High GDP with measures is about the same, while in scenario S3-Low GDP is smaller for about 100 million m<sup>3</sup> compared to S1 and S2.

The most influential factors of increase in gas consumption are the planned gas cogenerations (location of Banja Luka in all scenarios and location of Prijedor in the scenario S2) with an annual consumption of 300 million m<sup>3</sup> and the refinery with consumption to 120 million m<sup>3</sup> of

gas (if all the energy and technology needs were met using natural gas, the consumption could be up to 400 million m<sup>3</sup> of gas).

A large share of industry in the present structure of consumption has the effect of constant natural gas consumption during the year. Development of gas system and gas market increases the share of sectors with seasonal character of consumption (households, services). Due to changes in the structure and increase of seasonal changes in consumption, the need for operational storage capacities for natural gas will increase from 24 million m<sup>3</sup> in 2015 to 110 million m<sup>3</sup> in 2030. For strategic storage at the level of 25% of total annual gas consumption, 256 million m<sup>3</sup> of storage capacity needs to be provided by the year 2030. In the period until 2015 the storage capacities can be provided in Hungary and in the later stages of development of regional network of gas pipelines and underground storage systems in closer systems of Serbia and Croatia.

By the year 2030 it is necessary to ensure the gas pipeline capacity of 4.3 million m<sup>3</sup> of gas per day, which makes the new total import capacity of about 1 570 million m<sup>3</sup> of gas annually. Two alternatives are observed for the construction of new import routes (connecting to the systems in the surroundings) and internal gas pipeline network development.

**The strategic interest of Republic of Srpska is building the entire gas pipeline system Sava in the period covered by the Strategy, delivering natural gas to major consumption centers as soon as possible, secure supply and creating a competitive open market of gas. These goals can be achieved through one of the following two alternatives.**

#### **ALTERNATIVE 1**

**In the first phase the pipeline Sava is built to the consumption centers (Banja Luka, Bijeljina and Brod) in accordance with the routes determined by the Spatial plan of the Republic of Srpska. Realization of Sava project envisages gasification of the northern part of Republic of Srpska, the construction of backbone gas pipeline from Prnjavor Mačvanski (a connection point to the gas pipeline system of Serbia) to the Novi Grad and building distribution systems in cities in Posavina. A concession was granted to build a gas system Sava and first projects were made.**

**Connection of Sava gas pipeline to some of the gas systems in the surroundings is possible in second phase in case of gas importers interest.**

#### **ALTERNATIVE 2**

**The first phase provides the gas supply of gas consumption centers from the nearest available system: connection to a system of Serbia in Bijeljina and connections to the system of Croatia in Brod and Gradiška.**

**After consumption growth, in the second phase the backbone of the gas pipeline system Sava is built, i.e. the gas pipeline Bijeljina – Banja Luka.**

Given these alternatives, the possibilities for gas import and results of optimization of transportation gas system development in the Republic of Srpska, the following can be concluded:

- **optimal supply points are Gradiška (the greatest consumption point Banja Luka is gasified using this point with the least cost), then Bijeljina from Serbia, and Brod from Croatia,**
- **the following areas can be determined as the first phase of gasification**
  - Gradiška, Laktaši and Banja Luka from Gradiška direction;
  - Brod, Derventa and Modriča from Brod direction;
  - Bijeljina from Serbia direction, and
  - Vlasenica and Pale from existing system,
- **the following areas are Doboј and Prijedor, then gasification of the Prnjavor area, i.e. Brčko from the Bijeljina direction,**
- **connecting system Bijeljina - Banja Luka in full.**

In the case of an agreement with BH Gas and further development of gas pipeline Brod-Doboј to Zenica, the construction of 20 inches gas pipeline in first phases of system construction is recommended.

Area of Herzegovina, or the town of Trebinje as the main consumption centre, can be gasified using system of Adriatic-Ionian gas pipeline after its construction.

System configured in this way enables gas supply to Republic of Srpska from the South stream and from Russia, via Hungary from direction of Serbia and Croatia, supply from gas pipeline Nabuko from Hungary and Croatia and from LNG terminal on the island of Krk from the Croatian gas pipeline. Diversification of import routes and construction of gas pipeline Sava increase the security of supply and improve the technical safety. By more import points and gas pipelines a double ring structure is created (ring Gradiška-Banja Luka-Derventa-Brod-Gradiška through the system of Croatia, and ring Brod-Derventa-Bijeljina-Srbija-Brod through the system of Serbia and Croatia after the construction of gas pipeline between Serbia and Croatia as the part of the gas ring of southeastern Europe).

The concept of the gas ring provides, with minimum cost, gasification of area in Southeast Europe, and access to existing and planned underground gas storages in the region (in Serbia, Croatia, Hungary).

For the development of distribution systems by 2030, 5098 km of distribution pipelines need to be built with an investment of 355 million BAM. Distribution of natural gas will be conducted on the basis of a concession granted by public tender. Gas distribution is organized as a regulated activity. Area of distribution systems will be determined in such way to provide quality system planning, where market size ensures a reasonable capital return to investor.

The size and number of distribution areas will be determined in a manner to have roughly equal gasification opportunities, i.e., favorable relation of investment and consumption. In determining the distribution areas the principle of solidarity shall be guidance, i.e. that the larger consumption centers with a favorable investment and consumption relation ensure the possibility of development in areas with unfavorable relation of investment and consumption. It would be very convenient that the development of gas distribution network evolves in the framework of current and future distribution companies.

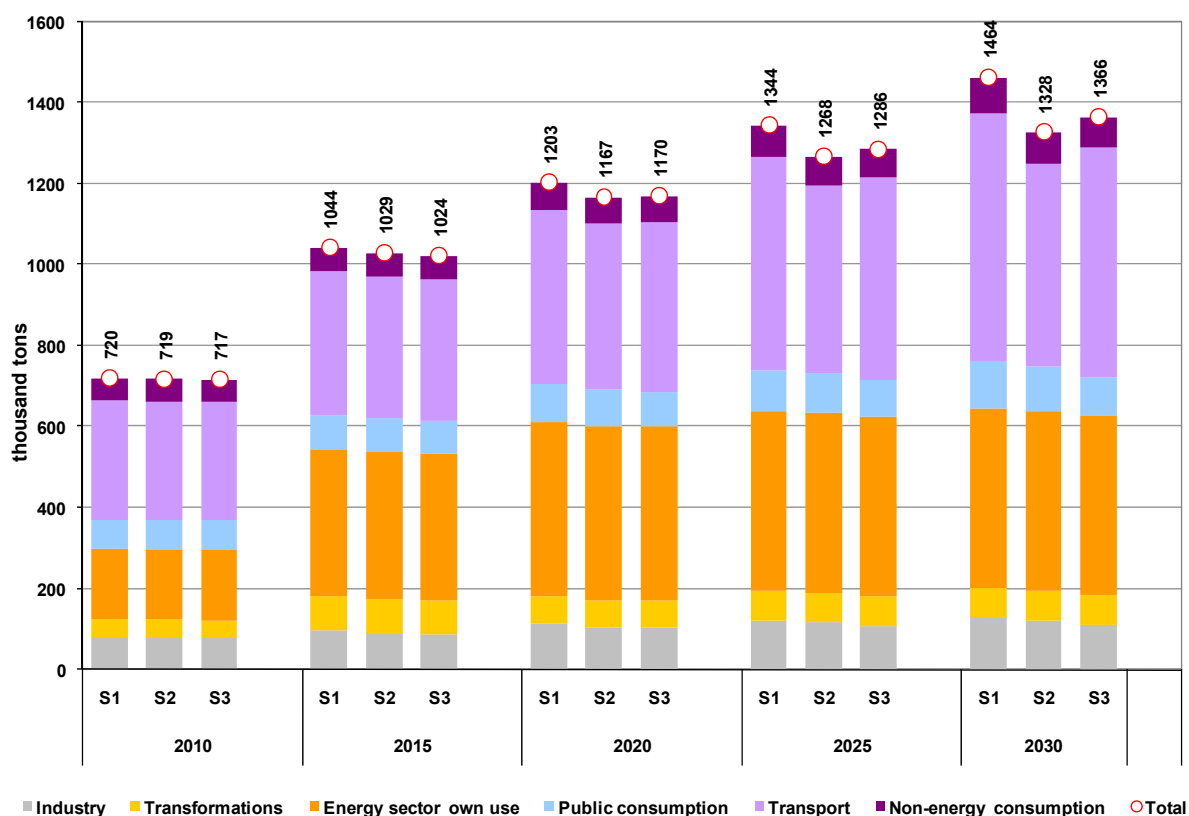
## 9. OIL SECTOR

Oil products occupy a significant proportion of the total energy consumption and they are the predominant energy source after coal in Republic of Srpska. The bases of the oil sector are Bosanski Brod Refinery and Modriča Oil Refinery.

The objectives of the oil sector development in Republic of Srpska are:

- continued research of geological reserves of oil and gas,
- establishing a system of obligatory reserves of oil and oil products,
- achieving the quality of oil products on the market of Republic of Srpska in accordance with valid EU standards,
- the introduction of modern technological innovations in the oil production facilities in order to reduce their own consumption and reduce emissions of harmful gases into the atmosphere,
- harmonization of the laws and regulations which regulate the impact of oil sector on the environment with the EU standards.

Increase in consumption of oil products is expected in all development scenarios by 2030. The share of liquid oil fuels in total final energy consumption increases from the existing 33% to about 35% in 2030. Expected consumption in 2030 (Figure 9) will amount between 1.328 and 1.464 million tons, depending on the development scenario.



**Figure 9. Consumption of oil products in RS by 2030 for three development scenarios**

One of the development objectives of the oil sector in Republic of Srpska is the exploitation of domestic reserves of oil (and natural gas) to reduce dependence on imported crude oil. Performed geological studies indicate the potential presence of commercially profitable oil

reserves. Further research will be intensified by involving interested partners through granting or purchasing concessions or some other form of financing. At the same time the administrative capacities will strengthen within the ministry responsible for collecting and processing data related to concessions for geological researches and/or exploitation of mine resources for which the obligations are determined by the Law on geological researches, the Mining Law and the Law on Concessions. Also, the cooperation between competent ministry and the Commission for Concessions of RS will be increased through continued joint working body composed of representatives of these two institutions.

With the aim of ensuring a regular supply of oil and oil products, a system of obligatory reserves will be established. Establishment of appropriate system will be carried out by an independent authority for obligatory reserves with the tasks of the organization, supervision and management of reserves. For the purpose of storing obligatory reserves, the existing storage capacity in the RS will be used, but only if they will not be enough, new ones will be built.

Laws and regulations on the quality of liquid oil fuels will be adapted to current standards in the European Union in order to improve the quality of oil products in the market of the Republic of Srpska. Dynamics of adaptation will be matched with the real possibilities of domestic oil refinery and the transition period will be defined to allow the refinery to gradually achieve European standards of quality.

To minimize adverse impacts and preserve the environment, laws and regulations relating to the limitation of emissions into air, water and land from the oil sector (refineries, storage terminals of oil and oil products, gas stations) will be harmonized with EU directives.

In addition to emissions into the air due to the oil products combustion, a significant negative impact occurs during the use of oils and lubricants in agriculture, forestry and marine transport. With the aim of reducing such impacts, the use of biodegradable oils will be promoted and a legal framework that will ensure their wider use will be established.

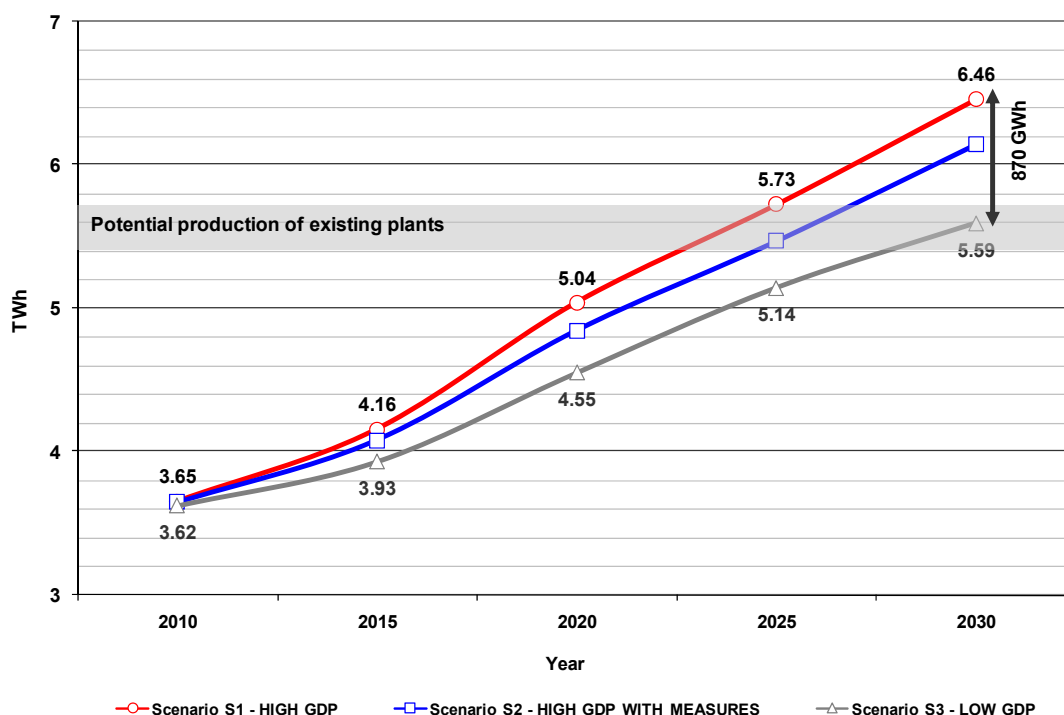
## 10. POWER SECTOR

The main objective in the electricity sector is to ensure continuous and quality electricity supply to all customers in the territory of RS by the market-formed and acceptable prices, in a manner that is consistent with the principles of environmental protection.

The basic assumption for the development planning of the electricity sector in the RS is the complete opening and regulation of the electricity market in accordance with the EU directives from 1<sup>st</sup> January 2015.

### Electricity consumption

Total electricity consumption on the transmission grid (Figure 10) will rise from 3620 GWh in 2010 at 5590 to 6460 GWh in 2030 (depending on scenario).



**Figure 10. Total electricity consumption on the transmission grid by 2030 for three scenarios**

Increase of the load factor of power system from the current 55% to about 64% is expected by the end of the observed period. Increase of the load factor is a consequence of the following changes and activities in the system:

- use of measures for management of consumption,
- gradually setting and reaching the market level of electricity prices,
- changes in the structure of final and seasonal electricity consumption (increase of the share of industrial consumption, increase of consumption in summer months),

- reducing non-technical losses in distribution,
- increase the level of payment.

Basic measures for management of consumption include:

- informing consumers,
- promoting and stimulating the use of energy efficient devices and methods of electricity consumption (energy efficient lighting, efficient appliances for household, reduce heating using electricity, etc.),
- use of tariff systems that stimulate customers to change the way and time of consumption,
- remote management of consumption for greater customers with contracts on limited supply during peak loads, etc.

The objective is to reduce total losses in electricity distribution from 17.2% in 2008 to 6.5% in 2030. The greatest loss reduction is expected in the period by 2015 due to the use of binding and cost-based programs for reduction of non-technical losses:

- binding targets for reduction of technical and non-technical losses will be established for each distribution area,
- distribution system operators will develop programs of measures to reduce losses,
- Regulatory commission for energy sector RS shall follow and monitor the implementation of measures and their effects, based on pre-defined comparison indicators.

## Electricity production

**The main objective of the activities of the RS Government and other authorities in electricity production is further creating of conditions for meeting domestic needs for electricity through production in the territory of RS.**

Development of RS system is seen in terms of electricity market development of Bosnia and Herzegovina and Southeastern Europe. The power system and electricity market in the RS are relatively small. The largest producers and exporters of electricity in the region of Southeast Europe are Romania and Bulgaria, which base their export on nuclear power plants and are already included in the trading system of emission rights. Electricity export from BIH is based on coal-fired thermal power plants. Electricity production from coal-fired power plants is important for almost all systems of Southeast Europe.

The basis of area of the RS, in terms of electricity production development, is the availability of natural resources (primarily coal and hydro energy), defined legal framework and the existing infrastructure of transmission grid. RS system is well connected with neighboring systems, and there is a possibility of selling electricity in the surrounding markets. Placement of electricity to other markets will depend on the relationship between supply and demand, market prices and the possibilities of regional transmission grid.

**Through more quality organization and regulation of the sector, conditions in which the area of RS has comparative advantages for the development of electricity production activities in comparison to neighboring systems, will continue to create.**

**The limiting factor for all power systems and electricity generation in the region, including the systems of BIH, and thus the RS, is the future uncertainty regarding restrictions on emissions of greenhouse gases.**

This uncertainty is partly dependent on external influences, i.e. taking over the obligations under international treaties, and in part defined by the internal development options. Systems in which production is based on thermal power plants using fossil fuels (especially coal) will be strongly affected and limited by the future obligations (reducing production and/or the use of more expensive technologies of "clean" coal).

**BIH, and thus the RS, has no quantified commitment on greenhouse gases emission reduction. Obligation of reduction or limited increase of emissions and inclusion of BIH, and thus the RS, in the trading system of emission rights can be expected in the period between 2015 and 2020. Future commitments to reduce emissions will directly affect the opportunities and options for development of power sector in the RS (the competitiveness of domestic coal, the choice of fuels and technologies with lower emissions of carbon dioxide, the increase in production costs and electricity prices).**

The total demand for electricity in the RS is nowadays satisfied by production in domestic plants while surpluses of electricity are exported to other markets.

Electricity production in the RS is based on thermal power plants that use domestic coal and on hydro power plants. Between 20 and 30% of total production is exported to other markets. Security of supply is high, considering that domestic sources of primary energy are used. According to the expected electricity demand scenarios, existing production capacities are sufficient to satisfy the total electricity demand to approximately 2020/2025 year.

The projected lifetime of existing thermal power plants completes in the period 2020/2025. It is possible to revitalize and extend their lifetime for additional 15 years (in this case the plants' retirement would be after 2030) or gradual closing while building new/replacement units at the same locations. All existing hydro power plants will be in operation by the end of the observed period, with appropriate interventions to revitalize the electro-mechanical facilities and construction buildings.

The RS Government has granted several concessions for construction of power plants with total capacity of about 920 MW and expected annual production of about 4550 GWh (TPP Stanari, TPP Ugljevik II, Heating plant Kotor Varoš, HPP Ulog, HPP Krupa, HPP Banja Luka niska and HPP Dabar) and a number of concessions for building small HPP with total capacity of about 160 MW and expected annual production of 500 GWh.

**RS Government and the Commission for concessions will actively monitor the performance of obligations under the concession contracts and the dynamics of realization of projects and will continue to support and strengthen institutional help to concessionaires in order to timely fulfill obligations under the concession contracts and enable the completion of construction of planned facilities.**

**RS Government and relevant ministries will work in cooperation with the competent authorities of Bosnia and Herzegovina and the Federation of BIH, on the establishment of strategy and position of the Republic of Srpska and BIH in international bodies and agreements that deal with issues of climate change and reducing emissions of greenhouse gases.**

The objective of these activities is creating clear regulatory framework for energy sector development, especially for electricity production, considering the fact that coal-fired thermal power plants represent important part of the existing system and important option of future development.

**Until determining the position and future obligations of BIH, and thus the RS, in the area of climate change and limited emissions of greenhouse gases, no decisions that may directly and negatively affect the future development of electricity market will be made (e.g. granting of exclusive and free rights on emission to certain companies). In electricity generation the system development will be directed with the aim of limited increasing of greenhouse gases emissions.**

In this sense, new projects for the utilization of energy potential of water streams in the RS will be promoted and developed. Locations of objects that are observed as prime candidates for construction by 2030 are:

- HPP Dabar
- HPP Buk Bijela and HPP Foča – expected construction in period by 2020,
- project Gornji Horizonti (HPP Dabar -160 MW, 230 GWh, EUR 180 million – concession granted in April 2011, HPP Nevesinje and HPP Bileća) – expected completion of the project during the period 2016/2020,
- project middle Drina (HPP Tegare, HPP Dubravica and HPP Rogačica) in period after 2020.

The process of preparation and construction of hydro power plants is rather long (10-15 years). Therefore, in addition to these hydro power projects, preparation of documentation and preparation of construction of the following hydro power plants will be making: HPP Sutjeska, HPP Paunci, HPP Mrsovo, HPP Dubrovnik II, HPP Tegare, HPP Dubravica and HPP Rogačica.

**The energy potential of some water streams is shared with neighboring countries/entities and the exploitation of this potential will be in accordance with future agreements with interested parties. All open issues related to past investments in the development of power plants will also be addressed by agreement with interested parties, with full protection of the interests of the RS.**

Existing locations of thermal power plants are kept, for which two development options are being considered. The options are consistent with the objective of limited increase of carbon dioxide emissions, i.e. retention of electricity generation and coal production at existing level or limited increase.

<b>The development options of existing locations of thermal power plants</b>	
<b>Option A</b>	<b>Option B</b>
Retirement of TPP Gacko 1 and TPP Ugljevik 1 in 2020/2025 and construction of new/replacement units	Extension of lifetime of TPP Gacko 1 and TPP Ugljevik 1 until 2035/2036
<ul style="list-style-type: none"> <li>▪ Construction of a 300 MW block in TPP Gacko</li> <li>▪ Construction of a 300 MW block in TPP Ugljevik</li> <li>▪ The use of modern technological solution</li> <li>▪ Increase of the degree of efficiency (&gt;40%)</li> <li>▪ Increase of the power of existing locations</li> <li>▪ Increase of electricity production</li> <li>▪ Reduction of specific carbon-dioxide emission</li> <li>▪ Relatively high investment (1.64 billion BAM or EUR 840 million)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Retention of existing technological solution</li> <li>▪ Limited increase of power</li> <li>▪ Maintaining or slightly increasing electricity production</li> <li>▪ Limited possibility to increase the degree of efficiency (to 35%)</li> <li>▪ Maintaining the carbon-dioxide emission at the existing level</li> <li>▪ Expected lower investment*</li> <li>▪ Expected higher cost of operation and maintenance</li> </ul>

\* - the exact cost of lifetime extension is not known

The structure of electricity production by energy sources (option B) is shown in Figure 11.

Promoting and increasing the energy efficiency of conversion using modern technological solutions in existing and new power plants and industrial facilities refers to the consideration of the construction of cogenerations in the places where this is possible, i.e. at locations where there is the need for heat and where it is technically possible and economically justified to use such systems. When possible, domestic sources of primary energy will be used for cogeneration (coal, biomass).

**The use of high-efficient gas cogenerations is expected in urban areas. Interesting sites for gas cogenerations are Banja Luka, Prijedor and Doboј as larger centers of consumption concentration in the RS with systems of district heating.**

The advantages of using gas cogeneration in urban areas are gradual replacement of fuel oil by cleaner energy source, reducing emissions, higher efficiency and electricity generation in the centers of consumption. Feasibility studies will be made for these projects and necessary preconditions for the implementation will be created.

**Preconditions for the implementation of gas cogenerations are regulation of electricity market, district heating sector and the development of a gas pipeline network including connection to the new import route in accordance with regional gasification projects. Commissioning of gas cogeneration facilities is expected around 2020.**

Projects of new power plants will be developed independently, in cooperation with neighboring countries and entity (when there is share of resources) and with interested parties, including the private sector. National and European regulations on environmental protection shall be respected and implemented.

Priority activities in field of electricity production are:

- revitalization of existing thermal power plants with objective of:
  - lifetime extension,
  - improvement of environmental characteristics (especially the reduction of emission of sulfur dioxide and particles),
  - improvement of technical characteristics (reduction of the number and duration of outages, efficiency increase and increase of output and production),
  - improvement of the economic characteristics (reduction of operation and maintenance costs),
- making final decision on extending the life of existing thermal power plants by the end of the observed period (i.e. after 2030) and taking appropriate actions to build new/replacement units or renovation of existing units,
- revitalization of existing hydro power plants and the introduction of modern systems for planning and optimization of operation of hydro power plants,
- resolving open issues of joint investments in power plants in the past and future investments in collaboration and in arrangement with interested parties,
- review of preliminary projects for the construction of power plants and adjustment with spatial, water-management and other development plans,
- monitoring the fulfillment of the obligations of existing concessioners, reviewing and making necessary amendments to the policy of granting concessions and granting new concessions for the construction of power plants,
- continue to create the conditions for private sector participation in the activities of the power sector, including the creation of conditions for the use of different sources and ways for financing projects,
- examining the potential for the use of renewable energy sources, especially wind and small hydro power plants,
- establishing a mechanism of incentives for the production of electricity from renewable energy sources and high-efficient cogenerations.

Depending on the scenario of electricity consumption, scenarios of development of renewable energy sources and options to extend the lifetime of existing plants, total investments in construction of new and rehabilitation of existing power plants by 2030 are estimated:

- for Option A investments are between 5.14 and 6.66 billion BAM (excluding the investments in the development of mine),
- for Option B investments are between 3.82 and 5.36 billion BAM (excluding the investments in the development of mine),
- most of the investments relates to project TPP Stanari - 1 billion BAM, which will be implemented by 2015,
- in all scenarios, the construction of TP-HS Banja Luka using natural gas around 2020 is expected, with total investment of 270 million BAM,
- investments in large HPPs are at the level of 1.37 billion BAM,
- in case of intensive development of renewable energy sources (i.e., the introduction of strong incentives for their development), investments in this segment reach 1.7 billion BAM (scenario S2 - High GDP with measures).

The production of electricity in the RS will increase significantly with the expected commissioning of TPP Stanari in 2015, which will also affect the possibility to increase electricity export. The construction of new power plants will increase the production by the end of the observed period. Increased production will meet the domestic demand, while the placement of surplus to other markets will depend on prices and market demand. It is expected that a certain number of plants will be realized by the system of potential sharing, i.e. sharing of electricity production, based on joint investments.

A significant limitation of greenhouse gas emissions or introducing taxes on emissions of carbon dioxide in the future will affect the limitation of electricity generation from thermal power plants using fossil fuels, primarily coal-fired power plants, or on reduction of their market competitiveness.

Estimated total consumption of coal for electricity production by 2030 year is about 108 million tons, and gas consumption between 2.4 and 3.3 billion m<sup>3</sup>. Expected emission of carbon dioxide rises from the current 3 million tons to 6-7 million tons in 2030.

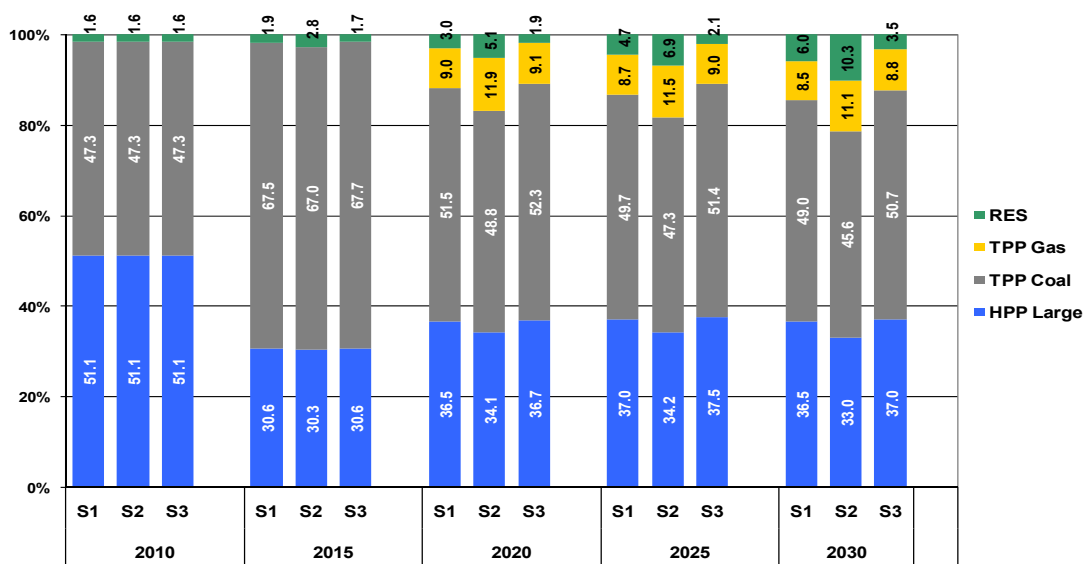


Figure 11. Structure of electricity production for three scenarios, with option B (extending the lifetime of existing thermal power plants)

### Electricity transmission

The network of 400 kV is satisfactorily built and connected in a loop throughout the territory of BIH, and it is satisfactory connected to all neighboring systems (Serbia, Montenegro and Croatia). The exception is area of Banja Luka that is radially fed by one 400 kV line, and radial connection through 400 kV network HPP Višegrad. 400 kV network is of great importance in achieving even solid connections with neighboring power systems (e.g. Prijedor-Bihać-Zagreb, HPP Višegrad-Pljevlja and internal 400 kV links within RS: B. Luka – Prijedor and Gacko – HPP B.Bijela).

The 220 kV network within Republic of Srpska has an important role in electricity transmission. SS 220/110 kV Prijedor 2 and Trebinje contribute significantly to security of supply of the wider area of Prijedor and Trebinje. 220 kV network is modeled satisfactorily in the RS.

110 kV network was developed in the area of RS. It is necessary to solve the problems of radial power supply of certain SS 110/x kV. For lines with a smaller cross-section of conductor, cabling of individual stocks is predicted in urban areas, and construction of double 110 kV overhead lines with conductors of a 240 mm<sup>2</sup> cross-section in rural areas, possibly using existing corridors.

Elektroprenos BIH should ensure in the future connection of all power plants and new customers according to the (n-1) criterion specified by the Grid code. In case of intensive construction of power plants, where the installed power of generation facilities in the territory of

RS would significantly exceed domestic needs, it will eventually be necessary to further strengthen networks of higher voltage levels. That would be primarily a 400 kV network which would enable export of electricity to the market of Southeast Europe and other markets (Italy, Turkey, Central Europe).

Strategic orientations in planning development of the transmission grid in the RS are:

- organization of transmission and solving problem of company operation,
- further development of the 400 kV network primarily involves the construction of 2 x OHL 400 B.Luka – Prijedor 2 – Bihać – Zagreb, the corresponding transformation 400/220/110 kV Prijedor 2, and connection of SS 400/220/110 kV Prijedor 2, by 400 kV voltage to the SS Bihać 400/220/110 kV and Zagreb (Zagreb south, Tumbri or etc.),
- solving the radial connection of HPP Višegrad to 400 kV network by building new 400 kV lines from the HPP Višegrad to TPP Pljevlja and Buk Bijela,
- construction of new 400 kV line TPP Gacko – HPP Buk Bijela,
- of particular strategic importance for RS is to further connect with the surrounding systems, primarily by constructing 400 kV overhead line to Croatia (Banja Luka – Prijedor – (Bihać) – Zagreb) and Montenegro (Višegrad – Pljevlja),
- setting of compensation devices in the network (ballast) to repair occasionally too high voltages due to low loaded 400 kV and 220 kV lines,
- stagnation in the development of 220 kV network and normal maintenance until further notice, with leaving the 220 kV voltage level in SS Višegrad (since there is a plan to implement the 400 kV connection B.Bašta-Višegrad-Pljevlja),
- construction of new and rehabilitation of existing 110 kV lines, including the lines necessary for connection of new HPPs (small to medium sized of construction) and wind power plants (possible construction in the wider area of Nevesinje and Gacko), and 110 kV lines required for connection of new SS 110/x kV ,
- all 110 kV network in the RS, BIH and the surrounding systems should be built in parallel, a new cross-border connections at 110 kV voltage should be implemented if it is of common interest for network operators involved (with the retention of the existing 110 kV interstate connections),
- inclusion of new objects into the spatial plans in order to create the pre-conditions for their construction when the need arises, and provide the necessary funding,
- network revitalization, and eventual cabling of certain sections of 110 kV network due to the spatial limitations and the subsequent urbanization of the area traversed by the route of some lines (the problems expressed in Banja Luka, and the area between Banja Luka and Gradiška, and Banja Luka and Prijedor),
- future agreements on investments in the transmission network should be based on existing and future legal solutions and legislation.

### **Electricity distribution**

A significant share of direct transformation 110/MV is characteristic for the area of Republic of Srpska, i.e. the distribution of electricity without the mediation of the 35 kV network and 35/10 (20) kV transformation in the ownership of distribution network operator. Seen locally, the direct transformation prevails in area of Elektrokrajina. In contrast, the 35 kV network is highly developed, for example, in the area of Elektro Dobojski.

In the long term, the objective is to have a system with one level of medium voltage (20 kV) and one direct transformation (110/20 kV). Therefore, the development of medium voltage network is based on two, partly related, principles: the gradual replacement of 10 kV voltage level by 20 kV and a gradual introduction of direct transformation 110/10 (20) kV and the closing of the 35 kV network.

One of the main tasks in planning the distribution network is finding the optimal transient solutions, which will allow a gradual transition to a new concept, along with the use of existing network. It is a long and uneven process, whose speed of implementation mainly depends on local condition of 35 kV distribution network and local forecast of load increase.

Analysis of the necessary investments in reconstruction and development of the electricity distribution system in the area of Republic of Srpska shows that the planned total investment until 2030 is 1250 million BAM, with a noticeable gradual decline during the planning period, from about 60 million BAM per year by 2010 to about 40 million BAM in 2030 year.

Observed by types of facilities in the distribution network, most investments are allocated to the secondary medium voltage network (54%), then to the low voltage network (30%), while the rest goes to the primary medium voltage network and systems of management, measurement and communication. Structuring by the investment reasons shows that the largest part is determined by the construction of transformation MV/LV and the reconstruction of the low voltage network (55%), followed by the reconstruction of existing distribution network facilities (36%). A significant portion of the costs goes to replacement of existing meters by modern digital meters with remote reading and consumption management. With the program that assumes a mass replacement of almost 70% meters by 2020, investment reaches 8% of total investments in the distribution activity.

## 11. DISTRICT HEATING SECTOR

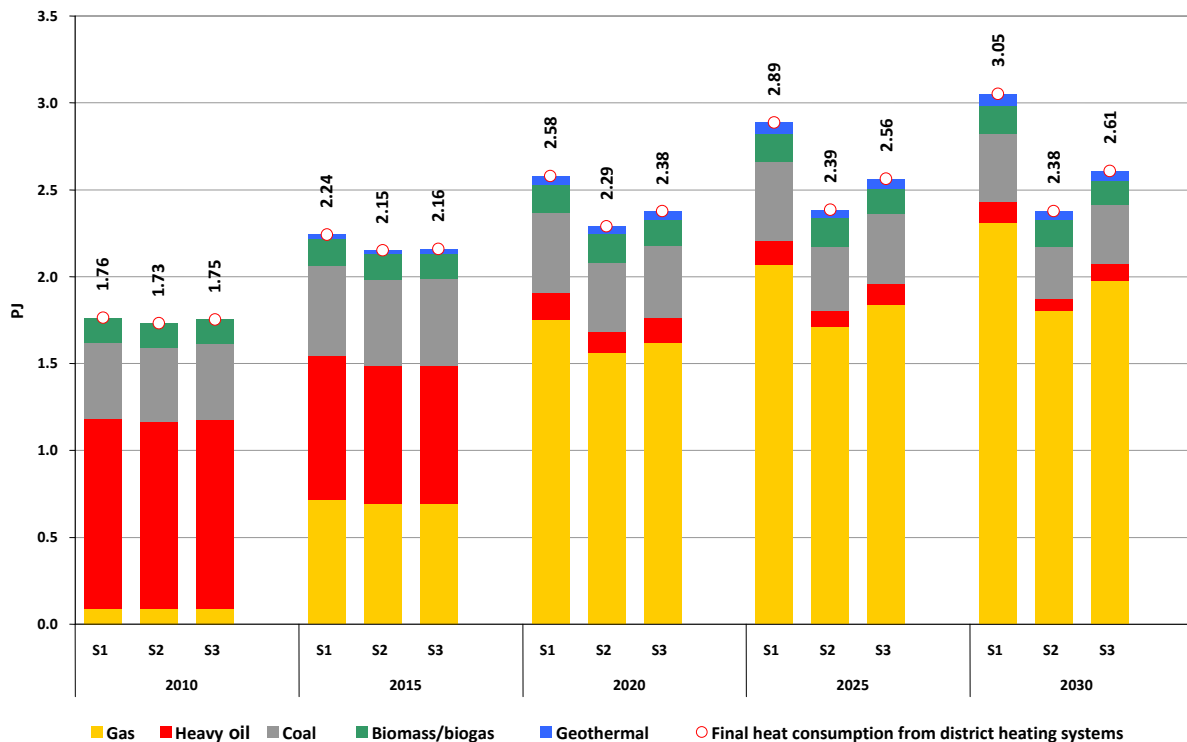
In the district heating sector 40 000 apartments of total surface area 2.3 million m<sup>2</sup> and 460 000 m<sup>2</sup> of office space are heated. Heat is supplied only for space heating and there is no supply of consumable hot water. Fuel oil, natural gas, coal and wood/wood waste are used as primary fuel.

District heating sector in Republic of Srpska is in a difficult and complex position. The situation in individual companies is different, and the basic problems in the work of the sector are:

- **age, low efficiency and poor maintenance of production capacities,**
- **age, poor condition and losses in heat distribution networks,**
- **difficulties in measurement, calculation and charging of delivered heat,**
- **low sales prices of heat and difficult economic position of companies.**

Nearly all the plants in the Republic of Srpska are in difficult financial position, short-term liquidity is problematic and liquidity indicators are bad. Only the Doboje heating plant has no such problems. The causes of the poor condition are the uncharged debts, high long-term obligations and high reserves of energy sources that block the liquid assets.

In the short term, the activities of the district heating sector will focus on construction of new and rehabilitation of existing generating capacities (including preparation for the transition from fuel oil to natural gas), reduction of losses in transmission and distribution of heat and increase the degree of charges.



**Figure 12. Structure of satisfying final heat consumption from district heating systems in the RS**

Increase of heat supply from district heating systems is expected in the period by the year 2030 (Figure 12). In comparison to 2008, the largest expected increase in consumption of final

heat from district heating systems is in the scenario S1-High GDP - an increase of 75%, then in scenario S3-Low GDP - about 53%. For scenario S2-High GDP with measures a minimum increase of only 38% is expected as a result of intensive measures to increase energy efficiency on the demand side (improving the thermal insulation).

The development of district heating sector will strongly be affected by the gasification of Republic of Srpska. Development of highly-efficient gas CHP in Banja Luka is envisaged in all scenarios. A gradual replacement of fuel oil by gas is expected in boilers. When planning the development of district heating system and system of distribution gas pipelines, it shall be taken into account the availability and competitiveness of these alternatives in certain urban areas. The development of district heating system can take place within existing and future power electric distribution companies, because these are already established and organized systems and it would be easier to realize such projects within them. Moreover, it is expected in scenario S2 to develop at least one additional smaller gas CHP in urban areas, and use of biomass and geothermal energy. It is expected that natural gas will have the largest share in the heat production in district heating systems at the end of the observed period.

The operation of district heating sector will be normatively regulated in order to achieve economically sustainable position and financial stability of companies for toplification. In particular, following issues will be regulated:

- **general conditions of production, transmission, distribution and supply of heat energy,**
- **procurement of energy sources, planning and management of energy balances and security of supply of heat energy,**
- **the introduction of measurement, control, management and charging of heat energy according to the actual consumption of individual consumer (leaving flat-rate calculation), which will stimulate increase of energy efficiency on the side of production and consumption,**
- **determination and regulation of the heat energy prices from the systems of district heating (tariff policy and tariff systems).**

When solving the problem of district heating sector and achieving economic viability, the graduality of process will consider the specific position of each company for toplification (recording the initial state and local conditions) and social moments will be taken into account.

**The RS government will provide the conditions that will enable to see this domain as energy, not only as a purely municipal, and establish a regulatory basis for determining issues of production, distribution, supply, connection conditions, policy of tariffing and tariff systems, relations and rights of customers.**

## 12. RENEWABLE ENERGY SOURCES

The most important RES in Republic of Srpska are energy of water streams (in large hydro power plants) and wood (for heating in households). The potential for hydro power plants development is significant and in large part unused, and in terms of renewable energy sources here is the emphasis on smaller streams, i.e. on the construction of small hydro power plants. The potential for the use of wind energy, solar energy, agricultural biomass and geothermal energy, which today is practically not used, is also significant.

The advantages of using renewable energy sources are:

- **diversification of fuels and energy sources,**
- **increase of security of energy supply,**
- **reduction of dependence on energy imports,**
- **reduction of use of fossil fuels,**
- **reduction of emissions of harmful substances into the environment,**
- **utilization of waste,**
- **the ability for development of local economic activities.**

Technologies for utilization of renewable energy sources are generally more expensive than technologies for utilization of fossil fuels (so-called "conventional technologies") or large-scale facilities (e.g. large hydropower plants).

**Targets for renewable energy sources shall be determined by each source, the size of building/facility and the use (e.g. for electricity generation, heat production). Incentive mechanisms will be established taking into account the possibilities of participation of domestic economy in the realization of RES projects, acceptable energy prices for end users and potential adopted international obligations.**

In this sense, the Act on fund and financing of the environment protection in the Republic of Srpska was adopted, establishing the Fund for environmental protection and energy efficiency of Republic of Srpska (Fund), with the aim of collecting and distributing funds for incentives for greater use of renewable energy sources. Funds will be collected from end users and/or environmental polluters. Incentive mechanisms will be directed towards the final product (e.g. incentives for electricity produced from RES) and towards investments in certain technologies (e.g. incentives for solar collectors, biomass boilers, geothermal pumps). In addition to incentive mechanisms at the state level, co-financing opportunities will be considered at the level of local communities and cooperation with international funds for these purposes.

Administrative support to development projects of renewable energy sources will be intensified. The existing procedures for RES projects realization will be simplified and enhanced and the missing procedures will be established with the aim of creating a transparent, simple and efficient procedures in coordination of competent authorities: ministries (for energy sector, environment, spatial planning), the regulatory commission, the operator of the transmission and distribution system, dedicated fund and local administration.

### Small Hydro Power Plants

Total hydro power potential in power range from 0.5 to 10 MW is estimated at 1500 GWh/year. The energy potential in small hydro power plants that were identified as candidates for the construction amounts approximately 212 MW, or about 650 GWh/year. The energy potential of small hydro power plants with installed capacity below 0.5 MW (micro and mini hydro power plants) has not been explored in Republic of Srpska.

Facilities that have installed capacity up to 5 MW are considered as small hydro power plants in Republic of Srpska. This is not in accordance with practice in EU countries, so the legislation that regulates this issue will be adjusted in a way that hydro power plants with installed capacity to 10 MW will be treated as small hydro power plants. Six small and mini hydro power plants of total installed capacity of 16.95 MW and average annual generation of 68.14 GWh are in the operation.

Based on the public call and unsolicited offers, the RS government has granted concessions for the construction of 107 hydro power plants (total of 47 concessioners), with a total installed capacity of 281.67 MW and expected annual production of about 1400 GWh. The RS government broke of a number of contracts for the construction of small hydro power plants in mid 2011, resulting in a reduction of the total planned installed capacity of small hydro power plants to about 160 MW and expected annual production of about 500 GWh

Based on past experiences in the implementation of small hydro power plant projects, the following issues will be resolved in the future:

- **testing of the remaining unprocessed hydro potential in small streams (establishing measurements and hydrological analysis) in order to create preconditions for the development of these sites,**
- **revise the procedures for issuing the necessary permits and approvals in order to accelerate and simplify the entire process and create equal conditions throughout entire area of Republic of Srpska (e.g., issuing urban-planning and environmental approval/authorization, making of spatial plans, standardization of procedures and duration of changes in spatial plans, eliminating overlapping of activities and authorities),**
- **monitoring the development of European Union regulations regarding water management, environmental protection, environmental impact and issues of building small HPPs,**
- **education of employees in the authorized bodies and institutions involved in procedures for project implementation of small HPPs,**
- **revitalization of existing small HPPs.**

The listed activities will help not only establish a system for the development of small hydro power plants, but also in the implementation of other renewable energy sources.

## **Solar Energy**

The average annual radiation exposure from the solar radiation to the horizontal surface area in territory of the Republic of Srpska ranges from 1.25 MWh/m<sup>2</sup> for the northern parts (Posavina region) to 1.55 MWh/m<sup>2</sup> for the southern area around Trebinje. Radiation exposure of surface inclined at an optimal angle, which ranges between 1.45 MWh/m<sup>2</sup> for the northern regions to 1.78 MWh/m<sup>2</sup> for the southern regions, is important for energy use of solar energy. In accordance with a change of latitude, the total annual amount of solar radiation decreases from northwest to southeast.

The present use of solar energy in the Republic of Srpska is limited to the use of solar collectors on a smaller number of households, and on some larger buildings, and to utilization of small photovoltaic systems.

Use of solar energy in the area of Republic of Srpska is expected in two groups: solar collectors for hot water and heat preparation and photovoltaic systems for electricity production.

The greatest potential of using solar collectors is in family homes, hotels, health facilities and sports facilities. When setting priorities, the installation of solar collectors should be stimulated in facilities where the consumption of fuel oil, electricity and natural gas would be reduced. Because of the relatively high cost of solar panels and additional equipment, co-financing mechanisms for this technology are necessary. Mostly, it is a grant that in the EU countries amounts up to 50% of the total cost of the system. Scenario S2 with strong measures of stimulation of RES development envisages installation of about 26 000 solar collectors in households by 2030.

Photovoltaic system with installed capacity of 1 kW with modules mounted at optimum angle in the Republic of Srpska can annually produce between 1100 kWh and 1350 kWh of electricity. Photovoltaic systems are one of the most expensive energy technologies with a cost of around 10 000 €/kW and for the wider use of photovoltaic systems (connected to the network) the incentives are necessary. The application of photovoltaic systems in combination with other sources of energy for electrification of distant facilities and settlements is also possible.

## **Biomass**

Biomass is the only renewable energy source at which it is possible to separate the place of origin and use. In addition, the biomass power plants have a stable production.

Current consumption of biomass for combustion is 16.96 PJ, which represents 92% of the potential of sources in the Republic of Srpska. Further expansion of wood biomass utilization for energy needs will be focused on increasing the efficiency of existing furnaces and boilers using wood and switching to more efficient forms of modern biomass (e.g. pellets). Production of pellets in the RS is stimulated by the statutory obligation on storage and disposal of wood waste. Wider use of pellets for space heating is expected after 2020.

According to the scenario S2 the use of 4% of the total potential for biogas production is anticipated by 2020, through building 4 agricultural plants for electricity and heat (size of 0.5 to 1 MW) and 4 industrial CHP using biogas from food and beverages factory (size of 1 MW). Heat from agricultural facilities will be used for smaller, rural district heating systems. Industrial plants will use the heat in their own production processes. Doubling of the capacity of these plants is expected by 2030.

The use of landfill gas is closely associated with the policies and measures of environment protection and the conditions for the utilization of this energy potential will be creating in cooperation of competent authorities. In addition to the existing landfills in Banja Luka and Bijeljina, landfills near Prijedor, Zvornik and Doboј are also planned. Total production of electricity and heat in 2030 in these locations is estimated at 22.2 GWh of electricity and 0.22 PJ of heat energy.

## **Geothermal Energy**

The conducted researches show that a large part of Republic of Srpska is promising in terms of the presence of geothermal water. Areas of greatest potential are parts of Posavina, i.e. Semberija and Lijevča polje. The energy potential is estimated at 1260 PJ (30 million tons of equivalent oil). There are also geothermal resources in Republic of Srpska that are used for balneological purposes. It will require additional research works in all boreholes that show potential for energy production.

It is estimated that geothermal sources of heat power of 50-100 MW<sub>th</sub> can be formed in area of Semberija, Posavina, the Banja Luka valley and Lijevča polje. Given the relatively high investments in the geothermal plants and the availability of other energy sources (coal and

hydro energy), production of electricity from geothermal sources in the observed period is possible with the introduction of incentives system for electricity production.

The greatest potential for the use of geothermal energy in the Republic of Srpska is in agriculture, aquaculture, and for heating/toplification of the settlements. Regarding this, activities for stimulation of using geothermal energy in district heating systems will be taken. In cases where the boreholes are distant from the settlements, the use of geothermal heat for heating greenhouses and plastic greenhouses will be considered and stimulated.

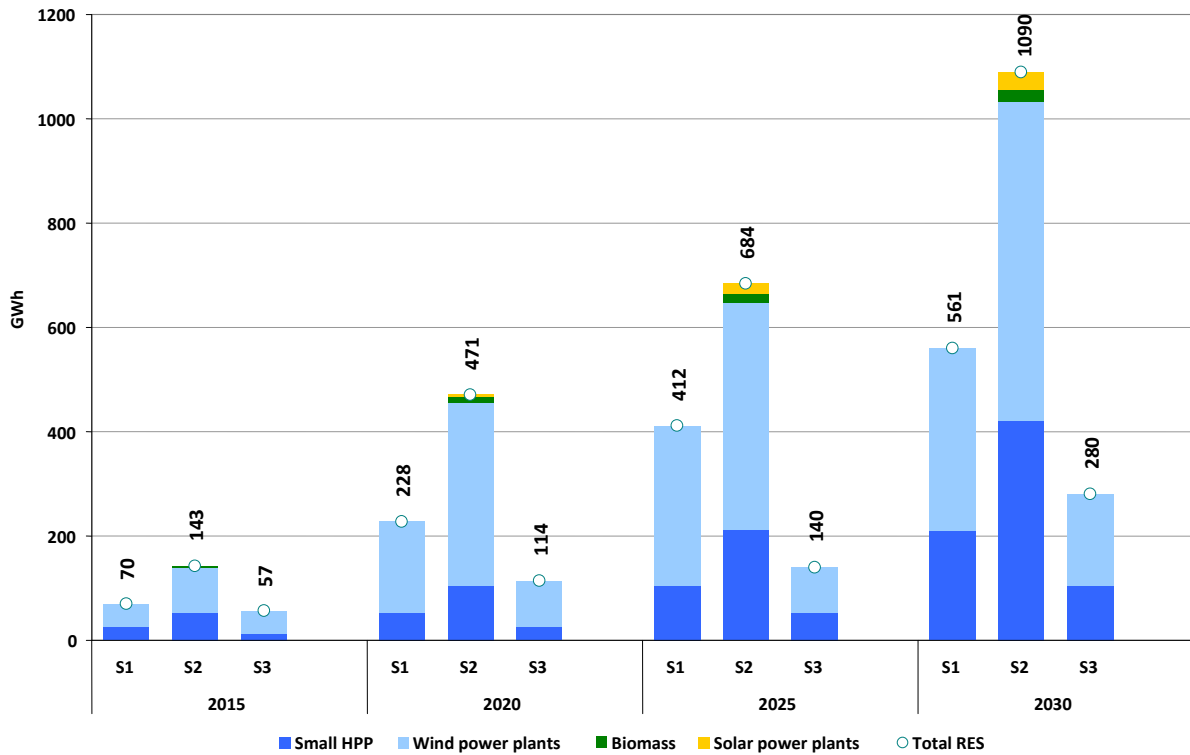
### **Wind Energy**

A model wind atlas was made for the area of Republic of Srpska that needs to be verified by wind measurements. The available wind potential in the area of the RS is significant. The most promising area for the construction of wind power plants is the southern part of the RS, in the area from Kalinovik to Trebinje. A theoretical potential of wind energy for electricity production is determined at thirteen locations with the total power of 640 MW and the total expected production of 1200 GWh/year. Nowadays, the wind in the RS is not used for energy purposes.

Observed sites are suitable for construction of medium-sized wind power plants. Further analyzes of selected areas shall take into account aspects of environmental protection and social impacts as well as the technically exploitable potential, depending on the conditions of micro-sites (access to location and availability of infrastructure). The intensity of the wind power plants development will depend on the mechanisms of incentives, the efficiency of procedures for the implementation of projects and possibilities of the domestic economy. The strategy also foresees the possibility of developing wind energy projects in line with the upper expected limit of the construction.

Given that the most utilization of RES is expected in the production of electricity, three scenarios of development of these technologies by 2030 are observed. The strongest development is expected in the scenario S2 (strong incentives), and lowest in scenario S3 (realization of only the best projects).

Production of electricity from planed renewable energy sources in the RS (without large HPP) for the three scenarios is shown in the following figure (Figure 13).



**Figure 13. Electricity production from planned RES in Republic of Srpska**

Depending on the development scenario, the total investments in the development of new facilities for the use of RES in the period by 2030 are estimated between 300 million BAM (for scenario S3) and 1.7 billion BAM (for scenario S2). In scenario S1, investments in new RES are estimated at 837 million BAM.

## 13. ENERGY EFFICIENCY

Energy efficiency is an integral part of the development guidelines of all sectors of the energy system. Particular attention should be paid to energy efficiency in the sectors of direct energy consumption, buildings, industry and transport, because the greatest possible effects are there. Energy consumption increase is reduced by energy efficiency measures, which reduces the need for building new capacities, energy imports and increases the security of supply. Increase of energy efficiency along with achieved energy savings contributes to reduced use of fossil fuels and reduction of emissions of harmful gases into the environment, economic development, increase in the number of workplaces and increased competitiveness.

In considering the possibilities and potentials to improve energy efficiency and rational management of energy in all consumption sectors in the RS, the current situation in the building sector was considered - residential and non-residential buildings, transport and industry, and possible concrete measures to increase energy efficiency in certain sectors of consumption were identified based on collected data and findings, with the analysis of impacts and consequences of their implementation. The emphasis is given to the need to build institutional and legislative environment as one of the preconditions for successful implementation of energy efficiency measures. All available experiences of other countries are unanimous in the conclusion that it is extremely difficult, almost impossible, to start the implementation of energy efficiency (EE) measures which require greater investments without stimulating measures.

### Energy efficiency in building sector

Energy efficiency in the building sector is an area that has the greatest potential for reducing overall energy consumption, which directly affects the more pleasant and quality stay in the building, a longer lifetime of the building and contributes to environmental protection and reduction of emission of harmful gases.

Building sector is particularly important in energy consumption because:

- **it participates in total final energy consumption in the RS with for more than 50%, with permanent increase of consumption as a reflection of increasing living standard,**
- **it has a large potential for energy and environmental savings,**
- **due to the long lifetime the buildings have a long and continuous impact on the living environment and energy consumption.**

Projects to increase energy efficiency in building sector can act as a sort of urban and architectural drives, as well as the space for the use of innovative technical and technological solutions for:

- raising the quality of construction, quality design of the energy concept;
- the construction of modern low-energy buildings;
- modernization and energy renovation of existing buildings;
- increasing the standard and comfort in buildings;
- reduction of maintenance costs through the lifetime of buildings;
- use of innovative technologies and solutions;
- development of integrated approach to design;
- long-term approach to the analysis of the building, taking into consideration its entire lifetime;
- reducing energy consumption and protection of environment.

The main objective of energy efficiency in buildings is to establish mechanisms that will permanently reduce energy needs in the design, construction and use of new buildings and reconstruction of existing, and remove barriers in introduction of measures of energy efficiency in existing and new residential and non-residential buildings stock.

Successful implementation of energy efficiency in building sector of RS will be based on:

- changing legislative environment and compliance with European regulations,
- increasing the obligatory level of thermal protection of existing and new buildings,
- increasing the efficiency of system for heating, cooling, ventilation and air conditioning,
- increasing the efficiency of lighting systems and energy consumers,
- energy audits and energy management in existing and new buildings,
- setting the target value of total annual consumption of building per m<sup>2</sup> or m<sup>3</sup>,
- introducing energy certificate as a system of labeling buildings and the adoption of a unified methodology for energy audits of buildings,
- ongoing education and promotion of measures for increase of energy efficiency.

Building sector in RS, which includes households and service sector, is the greatest single consumer of final energy with the share of total of 51.8% in final energy consumption in 2005, or 26.58 PJ (46.9% households + 4.9% service sector).

The expected consumption in the building sector without applying energy efficiency measures would amount 43.30 PJ in 2030, and to about 37.40 PJ in 2030 with applying measures in residential and nonresidential buildings. Under the condition of implementation of measures of energy efficiency in building sector, the share of final energy consumption in buildings could decrease to 42.3% in 2030, which would get closer to today's European average.

Useful consumption of heat energy in building sector is very high and it amounts averagely over 200 kWh/m<sup>2</sup>. The total housing stock in 2005 in the RS was around 31 million m<sup>2</sup> of residential area, of which 90% of family houses and 10% apartments. It is estimated that the total housing stock will amount to 44 million m<sup>2</sup> of residential area by 2030, of which 70-80% are family houses and 20-30% apartments. The total stock of non-residential buildings in 2005 amounted to 5.4 million m<sup>2</sup> of non-residential area, or about 4.6 m<sup>2</sup> per inhabitant, and it is estimated that by 2030 the total stock of non-residential buildings would amount to 13.5 million m<sup>2</sup> of non-residential area, or approximately 11.6 m<sup>2</sup> per inhabitant.

Without the active implementation of energy efficiency measures, energy consumption in building sector will continue to grow, and not only energy for heating but also cooling energy, by increasing standard. By applying energy efficiency measures through the legislative environment, it is assumed that the overall heat energy consumption by 2030 would be limited to a maximum of 40-60 kWh/m<sup>2</sup> for new residential and non-residential buildings. Energy renovation of existing buildings, especially those built before the 1987 represents the greatest potential for energy savings.

To achieve the planned savings in the building sector at the level of the RS by 2030, it is estimated that 136 960 of old housing units or a total of 12.25 million m<sup>2</sup> of surface area should be energy renovated. Needed heat energy in the building would be reduced by 60% at each energy renovation, primarily due to increased thermal protection and the implementation of more efficient technical systems in buildings.

**By using specified measures of energy efficiency the final energy consumption in households would be reduced by 15% by 2030 compared to the scenario without energy efficiency measures, and compared to the baseline 2005 year would increase by only 22%. The overall share of energy consumption in buildings - households and services,**

**in total final energy consumption would get closer to the today's European average and that is about 40%.**

It is important to emphasize that the scenario with measures to increase energy efficiency would not be possible to achieve without legislation, institutional and organizational measures and organized system of stimulation of non-commercial measures. Systems of stimulation need to be focused on the measures of thermal protection of buildings with the period of investment return longer than **4-5 years**.

This Fund will direct the part of funds to stimulate energy efficiency, in order to implement those activities and energy efficiency measures that are cost-effective for society, i.e. which result in positive externalities, and would not be implemented independently by the investor and/or are not cost-effective by criteria of financiers. Incentives should be implemented in the form of loans, subsidies, favorable interest rates, donations.

The construction of new low-energy buildings and energy renovation of existing buildings will be stimulated. The expected investment for investing in energy efficiency increase on the average building built before 1987, to achieve savings of 60%, is estimated to average of 100 BAM per m<sup>2</sup> of surface area. With an average investment of 100 BAM per square meter, this would mean a total investment of about 1.2 billion BAM in energy renovations by 2030. Assuming that 30% of total investment would be stimulated, it would mean the allocation of funds to stimulate energy efficiency of about 375 million BAM or an average of about 16-20 million BAM annually by 2030.

Given that the share of residential sector in relation to the overall building sector is over 85%, the greatest potential for energy savings is found in this sector. It is assumed that the service sector will recognize the potentials of energy efficiency by itself, and further develop plans for energy management. It should be noted that the rapid growth of service sector and increase of surface area share to 30% are expected, from which it can be concluded that all new buildings should be planned as energy efficient and low-energy buildings. It should be also noted that the sector of public buildings will first be obligated to make energy certificates and provide public information on how much energy is consumed in buildings for public use, and what is done to reduce that consumption. In that direction, Republic of Srpska should develop special programs to increase energy efficiency in public buildings, as well as plans for the systematic energy renewal of existing building sector.

The legislative framework should give emphasis on:

- **adoption of the Law on energy efficiency,**
- **developing an Action plan to implement the EU directive on energy characteristics of buildings,**
- **adoption of new Technical regulations that will regulate the stricter level of thermal protection and management of energy consumption in buildings in accordance with the EPBD (Energy Performance of Buildings) and EN 13790,**
- **adoption of new Technical regulations that will regulate the obligation of the energy certification of buildings, i.e. the classification of buildings according to energy consumption,**
- **adoption of new Technical regulations that will regulate the education of independent energy experts that will carry out energy audits and energy certification of buildings,**
- **adopting the methodology of energy audits,**
- **continuous education of various target groups and public informing.**

Furthermore, the problem of reducing energy consumption in residential and non-residential building sector needs an interdisciplinary approach, and thus overcome the lack of cooperation between different disciplinary approaches in defining problems and solving them. Organized monitoring, analyzing and solving problems of energy efficiency in building sector must refer the entire lifecycle of the building observed, i.e. from energy costs of production of construction material, through energy costs of the construction, to the use and maintenance of the building, until the moment when, due to deterioration or some other reason, the building in whole or in parts should be removed and converted into usable or unusable construction waste.

Such an integrated approach to design is defined as an approach that connects all the important architectural and construction elements and all energy systems of building into one system, in order to achieve optimal performances in terms of energy efficiency, environmental impact and internal quality and standard.

Integrated planning should begin at an early stage of design. If the energy-efficient technologies begin to apply at a later stage of design, the result will be a modest integration of measures that will probably be too expensive to implement. For this reason it is necessary to plan the introduction of energy efficiency measures in all development plans and project tasks to be implemented as quickly as possible in the newly planned construction.

### **Energy efficiency in industry**

Energy consumption in industry in RS has recently amounted 12% to 25% of total energy consumption in RS, i.e. from 18% to 35% share in energy consumption in industry of BIH. In the beginning of this decade, this share had decreased from 34% to 18%, but later increased to 35%. In absolute terms, energy consumption in the industry of RS increased since 2002.

Given the share of energy consumption in industry, the most important industries are: manufacture of metals, chemical industry, industry of non-metallic minerals, mining and quarries, production of food, beverages and cigarettes, textiles and leather production, paper and graphics production, machinery manufacturing and other industry.

Final energy consumption mostly, over 50%, goes to metal manufacturing sector. The largest share in this sector has Zvornik alumina factory. For the same reason, natural gas participates at the most in consumption among the fuels. Further large consumption sector is the production of food, beverages and cigarettes, while other individual sectors are significantly less distributed. The highest share in electricity consumption goes to sector of production of food, beverages and cigarettes.

Comparing the shape of final energy consumption, by far the most common fuel is natural gas, whose consumption has varied in the previous period. Then the most consumed are liquid fuels, primarily heavy oil. The next is electricity, while wood waste, coal and other solid fuels are less frequent.

The scenario of energy consumption in the industry predicts a doubling of final energy consumption by 2030 according to scenario S1, for about 3% lower growth according to scenario S2, and for about 12% lower growth according to scenario S3. It is assumed here that the processing industry has 4 to 5 times greater shares than agriculture, construction industry and mining. Electricity has a share less than one fifth in total so far consumption. It is assumed that this percentage will rise, but for measures of increasing energy efficiency is therefore recommended that they concentrate on the rationality in utilization of heat energy. Natural gas will maintain leading share among energy sources, so the area of measures implementation should focus on the efficiency of heat engines, reduction of distribution losses and efficiency of heat processes.

**The greatest potential for the implementation of measures in electricity is in efficiency of electromotor drives. Appropriate organizational measures - energy audits, sector analyses and feasibility studies of energy efficiency increase - are unavoidable in the proper energy policy for the industry.**

According to the complexity and investment intensity, implementable measures to increase energy efficiency can be divided into measures:

- **basic rationalization of energy consumption (change in behavior, load management, etc.),**
- **revitalization of electrical and thermal infrastructure, reactive power compensation**
- **interventions on consumers (replacement, repair, etc.)**
- **interventions in energy generators (repair, upgrade, etc.),**
- **building a new energy system (new energy plant and energy infrastructure)**
- **the introduction and improvement of whole regulation and automatization.**

Improvements should be planned so that the measures are taken according to the specified schedule, given that the first imply less investments, simpler projects and quicker profitability. Taking more complex and expensive measures has full meaning only when simpler and cheaper measures are implemented.

Phases of implementation energy efficiency projects in industry are summarized in the following hierarchy:

- |                     |    |   |
|---------------------|----|---|
| • preliminary audit | -> | knowledge on the potentials,                            |
| • full energy audit | -> | recorded actual situation and known necessary measures, |
| • feasibility study | -> | technical and economic analysis,                        |
| • project           | -> | technical details and financial plan,                   |
| • implementation    | -> | savings and rational use of energy.                     |

The presence of all these elements depends on the complexity of the project, but basically the results of one phase provide quality preparation of the other. Accordingly, where the individual phases of implementation are inadequate or absent, they need to be promotional, financial and organizational supported.

The potential savings in electricity consumption can be effectively grouped into the savings at:

- electromotor drives,
- lighting,
- air-conditioning,
- heating.

Listed groups are mainly present in the observation of all groups of consumers. Specific technological processes in the industry that consume large amounts of electricity should be analyzed separately.

The use of heat energy in industry is related to the specifics of the technological process of individual industry. Water is most commonly used as the medium. Only the process industry uses other fluids as heat transfer media in its technology. The efficiency of heat generators should be observed here - mostly boilers, depending on the fuel used, then the losses in the distribution of media, and the rationality in utilization of heat energy in the production process itself.

Performing energy audits in industrial plants has proven to be extremely effective measure to increase energy efficiency.

Elements of the performance of energy audit of production facilities, which are based on monitoring and analyzing the use of heat and electricity for various categories of consumers, mostly relate to following areas of energy use:

- lighting,
- electromotor drives,
- fans and pumps,
- compressed air systems,
- systems of steam,
- other production processes characteristic for certain industrial facilities (cooling, drying, specific heat processes, other separated industrial processes).

It should take into account that the production and processing of aluminum, is especially energy-intensive industry, where the specific consumption is approximately 22.3 GJ of energy per ton of alumina. The position of this industry emphasizes special attention in analysis of energy rationality. Energy consumption in industry of food, beverages and cigarettes, which is the next sector in the amount of consumption, is difficult to specify because there are lot of different processes, and it was thought until recently that energy consumption in this industry branch is not so significant. However, analyses show that in developed countries the food industry spends about 10% of the total amount of energy needed for the entire industrial sector. Here are particularly important measures of heat energy savings.

Preliminary analyses show that, among the industrial companies in the RS, in most cases is not considered that there is need for efforts to increase the rationality of using energy. Especially with the heat, in over 90% of situations it is considered that there is no such need, while in the case of electricity in just over 15% of the situations it is considered that improvements are necessary.

**To improve situation in this area, the RS government will take concrete measures to raise awareness about the importance of the rationalization in energy consumption at industrial subjects.**

### **Energy efficiency in transport**

Transport sector has a share of about 20% in total primary energy consumption of the EU. 98% of the total energy consumption in this sector is from fossil fuels. Since transport is also the fastest growing sector in terms of energy consumption, it represents one of the major sources of greenhouse gases and is largely dependent on fossil fuels import. Therefore, the implementation of energy efficiency policy in this sector is justified and necessary in order to achieve sustainable, competitive and modern system.

In short, the objective is to establish a unified, efficient and effective transport system that will:

- **provide high mobility of people and services,**
- **protect the environment, improve energy security, promote minimum labor standards for the transport sector and to protect travelers and citizens,**
- **transport sector should contribute to ensuring global energy security,**
- **increase the quality of workplaces and employees in the transport sector,**

- **worry about the protection of citizens in the role of users and providers of transport services,**
- **be innovative in supporting the implementation of the first two objectives: mobility and protection, by increasing efficiency and sustainability of the growing transport sector.**

These goals are absolutely consistent with the guidelines of the Lisbon strategy in terms of development of the EU. They are, however, of long-term character and represent a balance between economic growth, social welfare and environmental protection.

Road and air transport of the EU have already started to feel the benefits obtained by the realization of targeted goals, while significant activities in the railway and water transport are expected just in the near future.

It is necessary to increase the market potential for penetration of environmentally acceptable technologies, especially those that are in direct correlation with the greenhouse gas emissions.

Transition to environmentally friendly forms of transport should primarily be achieved there where already exist realistic predispositions, especially in long-distance transport, and in urban areas and on congested corridors. At the same time, all forms of transport will need to become environmentally friendly, safer and more energy efficient.

Finally, intermodality will lead to optimal and sustainable use of available transport resources.

The existence of a clear political will and definition of the exact objectives for the implementation of energy efficiency policy in the transport of RS is crucial for the realization thereof. Directive on energy efficiency and energy services (2006/32/EC), which promotes the stimulation of more efficient use of energy in all sectors of its consumption as well as in transport, can be used as a reference guideline in defining the goals of RS. The goal of increasing energy efficiency is defined in accordance with the Directive as reduced average annual increase of the reference scenario by 1% in the period 2008 – 2016.

It will certainly be necessary to carry out timely implementation of appropriate measures in order to achieve defined goals. In order to identify concrete measures and to propose optimal dynamics of their implementation, it is necessary to make the evaluation of measures from the point of optimum allocation of resources needed for their implementation (to achieve maximum effect of energy efficiency by using minimum required financial, infrastructural and organizational resources).

It will also be necessary to involve institutional capacities in order to implement energy efficiency measures. These measures should be informational, educational, legislative, fiscal, infrastructural and organizational.

## 14. ENVIRONMENT PROTECTION AND CLIMATE CHANGES

Development of energy sector inevitably has consequences on the environment; therefore, the energy planning must take this into account in order to minimize adverse impacts. The environment is effected through emissions into the air, water and land, noise caused by operation of energy facilities, problems with waste material and fitting into the space and visual impact.

In recent years, climate change mitigation has become a major global environmental issue. The main challenge is to provide long-term development of energy systems with reduced emissions of greenhouse gases. There is a tendency toward more efficient use of energy, using renewable energy sources, or using energy sources that emit no greenhouse gases and to more efficient transport system with greater use of CO<sub>2</sub> neutral fuel. External costs of climate change and pollution of the environment are tried to be internalized the by introduction of taxes on emissions into the air and by emissions markets.

In terms of reducing emissions of greenhouse gases, the Republic of Srpska will meet the challenges which will significantly affect development of energy systems and development of the economy as a whole.

These challenges can be seen as development opportunities, with the thought primarily to:

- **possible obligations to reduce emissions of greenhouse gases for the post-Kyoto period (after 2012)**
- **increasing energy efficiency and greater use of renewable energy sources,**
- **use of clean development mechanism,**
- **inclusion in the European emission trading system of greenhouse gases,**
- **development and application CCS technologies (CO<sub>2</sub> capture and storage),**
- **co-combustion in coal fired thermal power plants.**

Although the Conference of Parties to the United Nations Framework Convention on Climate Change, held in December 2009 in Copenhagen (COP-15), hasn't adopted a binding agreement to reduce global emissions of greenhouse gases, it is expected that in future it may still come to an agreement which should be ready for implementation by 2013. The EU plays an active role in finding solutions to the climate problem and is willing to take upon itself the obligation of a 30% reduction in emissions of greenhouse gases by 2020 compared to 1990, if other countries take commitments to reduce emissions significantly. The EU has also set a minimum goal for emission reductions of 20%. It seeks to involve all countries in combating climate change, but the obligations would depend on the degree of development of each country and of the potential for reducing emissions. Possible obligations under the new agreement would significantly affect the development of energy sector of RS.

Increasing energy efficiency and renewable sources are measures that contribute to reducing emissions of greenhouse gases, but also measures to increase security of supply due to the use of "domestic" energy sources, and also gives a strong incentive to development of domestic economy.

Construction of energy facilities that use renewable energy sources and facilities with greater energy efficiency is possible through so-called Clean Development Mechanism (CDM). It is expected that the CDM mechanism, with the possible refinement, will be active also during the post- Kyoto period (after 2012). Because it is needed to create conditions for the application of the CDM mechanism in the Republic of Srpska, i.e. to establish the competent authority for

implementation of CDM projects and to prepare draft of a by-law that would regulate the implementation of CDM projects.

**For the Republic of Srpska CDM projects are interesting, because in this way capital for plant construction is provided and the transfer of best available technologies is achieved.**

EU plans to achieve defined target of reducing emissions of greenhouse gases by using two approaches. Approach "restrict and trade" is applied to major sources of emissions, those obliged to emission trading (ETS<sup>1</sup> sector). Other sources of emissions (so-called non-ETS sector) are not liable to emission trading, and the sources of each country should define its own policies and measures to reduce emissions, in line with commitments at the EU level. The aim is to reduce emissions within the ETS sectors by 21% by 2020 compared to 2005, by introduction of the expanded and more efficient emission trading system by 2013. In other sectors is expected reduction of emissions by 10% on the level of the whole EU, and obligations of each state depend on the economic development in the range from +20 to -20%, but it is possible also increase in countries with lower GDP. The whole model was designed in order to secure the reduction of emissions of greenhouse gases by 20% in 2020 compared to 1990. If the EU accepts the obligation to reduce emissions by 30%, commitments of separate countries in the ETS and non-ETS sectors will be more severe.

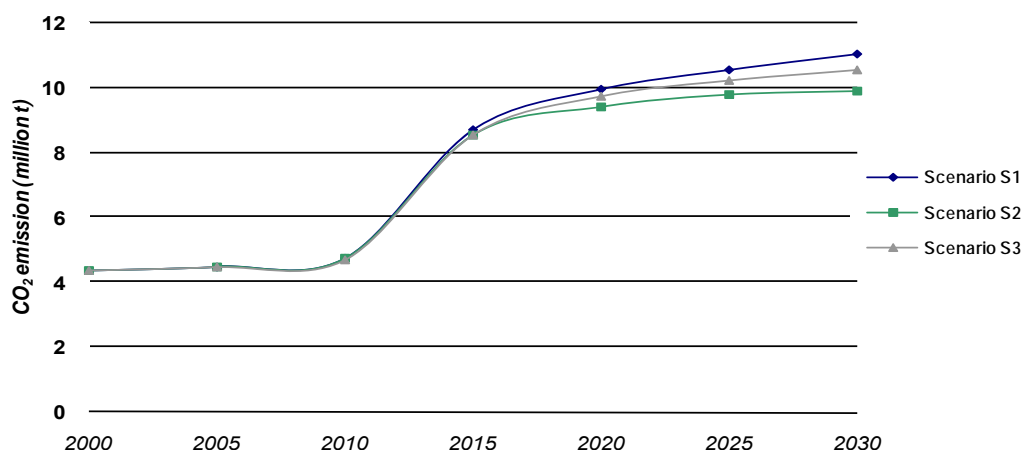
Development and application of technology of separation and storage of carbon dioxide is also one of the proposed solutions for reducing CO<sub>2</sub> emissions. The capture of CO<sub>2</sub> can be applied to all processes of combustion of fossil fuels in stationary power facilities, but the practical application due to the high costs of the technology is limited to large individual emission sources. Generally it is considered that this technology could be significant as a measure to reduce CO<sub>2</sub> emissions beyond 2020. The application of technology for capturing and storage of CO<sub>2</sub> would allow the construction of thermal power plants and industrial facilities using fossil fuels with almost no CO<sub>2</sub> emissions.

CO<sub>2</sub> emissions are also possible to reduce by co-combustion of biomass in coal power plants.

In the Republic of Srpska is expected significant increase of CO<sub>2</sub> emissions (Figure 14). The largest increase is expected in power sector because of the expected construction of new thermal power plants and in the oil refining sector as a result of the expected increase in production of petroleum products. These sectors will, by joining the EU, be included in the emission trading system and will have restricted emissions. A significant increase in CO<sub>2</sub> emissions is expected from road traffic. Emissions from road transport will be endeavored to reduce by development of sustainable transport, technological development and application of CO<sub>2</sub>-neutral fuels.

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<sup>1</sup> Emission Trading Scheme



**Figure 14. CO<sub>2</sub> emissions projection from energy sources in Republic of Srpska**

According to the scenario S1, CO<sub>2</sub> emissions (Figure 14) would be in 2030 by 37% higher than the estimated emissions in 1990 (8.1 million tons). The upward trend in CO<sub>2</sub> emissions in S2 scenario with measures is somewhat lower compared to the scenario S1, so that emission in 2030 according to scenario S2 is by 10% lower. CO<sub>2</sub> emissions in scenario S2 in 2030 arises by 22% and according to scenario S3 is larger by 31%, compared with emissions in 1990.

In the case of a possible construction of additional thermal power plant of 300 MW, these emissions would be higher by about 2 million tons. According to some indications from the EU, for all coal fired power plants whose construction began after 2020 will be required the possibility of installing additional equipment for the separation of CO<sub>2</sub>, i.e. installation of "carbon capture ready" equipment. This means that before the start of construction should be known how to separate CO<sub>2</sub> and where it would be stored.

**So, in all scenarios is expected increase of CO<sub>2</sub> emissions, even in the most favorable scenario S2 which implies that forced construction of power plants that use renewable energy sources (1689 MW, including large hydro), two new gas combined cogeneration and series of measures to increase energy efficiency and use renewable sources in other sectors of energy consumption. The expected increase in CO<sub>2</sub> emissions is not in alliance with global efforts to reduce emissions of greenhouse gases, under the Convention on Climate Change. However, it is necessary to take into account particularities of each member of the Convention so that possible future liabilities under the new global agreement should be consistent with economic power and possibilities of RS and Bosnia and Herzegovina.**

Because of its influence on acidification it is necessary to know the emission of SO<sub>2</sub>, and also to determine the NO<sub>x</sub> emissions which adversely affect both the acidification and eutrophication and the formation of tropospheric (ground-level) ozone. According to all scenarios, emissions of SO<sub>2</sub> have a downward trend. Compared with the estimated emissions in 1990 SO<sub>2</sub> emissions in 2030 would be lower by 81-83%. According to the scenario S1, SO<sub>2</sub> emissions would in 2030 amounted 34 017 tones. According to the scenario S2 SO<sub>2</sub> emissions would be in 2030 lower by 8%, while in scenario S3 would be lower by 2% compared to the scenario S1. Unlike SO<sub>2</sub>, for NO<sub>x</sub> emissions is expected growing trend. NO<sub>x</sub> emissions would be in 2030 higher by 10-22% compared to the estimated emissions for 1990. The lowest emissions in 2030 would be in the scenario S3 (29 050 tones), 3% higher in scenario S2, and 7% higher in scenario S1.

The problems of acidification, eutrophication and tropospheric ozone are regional in character and to resolve them it is necessary harmonized activity throughout the Europe, under the Convention on Long-range Transboundary Air Pollution and related protocols. In this respect the most important is the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone. Soon is expected revision of the Protocol and defining of national goals for 2020 to comply with the goals of reducing emissions of greenhouse gases.

Public interest is often focused on individual interventions, particularly in the construction or expansion of capacity of power plants. The effects of these interventions are of greater character and open issues of space availability, impacts on air, land and water, biodiversity and changes in the landscape. Quantification of the impact of individual intervention is estimated in the environmental impact study, whose acceptance is necessary for the issuance of building permits and environmental permit and start of operation of the plant. On the other hand, the strategic study of the environmental impact, which is made when developing regional special plans, analyzes the potential carrying capacity of the environment and compatibility of using the space for multiple purposes.

Existing power plants have to comply with valid legal regulations of the Republic of Srpska, which includes the issuing of environmental permits. Environmental permit integrates environmental conditions measures to prevent emissions into the air, in water, the land are also measures to reduce solid waste, and other obligations in order to mitigate environmental impacts. From the standpoint of thermal power plants, it is necessary in compliance with existing regulations also to take into account the expected obligations in terms of meeting the limit values for emissions into the air under the Large Combustion Plants Directive (2001/80/EC) and obligations under the Directive on Integrated Pollution Prevention and Control (96/61/EC). Obligations from these directives, as well as numerous other responsibilities, will be transferred in domestic legislation in the process of harmonization with EU guidelines.

Achieving the objectives of the Strategy, particularly in terms of greater use of renewable energy and energy efficiency, environmental impact, at all levels will be reduced. The analysis showed that administrative support to the implementation of measures and monitoring of environmental protection in the Republic of Srpska still is not satisfactory.

**In the coming period will be made organizational and financial efforts to ensure the functioning of institutions through which it will be encouraged programs and projects for environmental protection, increase of energy efficiency and renewable energy sources, for which a legal framework already exists. It will also be established a quality system of collecting data on emissions into the environment from stationary pollution sources (emission inventory), and system monitoring state of the environment (monitoring all elements of the environment).**

## 15. ENERGY MARKET, PRICES, SECURITY OF SUPPLY

**One of the main objectives of the Energy Development Strategy for the RS is development of the free and open energy market and energy sources that will provide safe and quality supply to all consumers in the territory of RS at reasonable prices, while adhering to generally accepted principles of environmental protection.**

To meet this goal, the RS will regulate energy markets for some energy commodities and energy sources in accordance with market principles and in accordance with the commitments and future obligations under the Energy Community, based on the *acquis* of the EU. In that way will be enabled integration of energy market of the Republic of Srpska into the regional energy market.

The basic prerequisites for creating a free and competitive market in the energy sector are:

- **Independent monitoring and regulation of energy market in order to:**
  - create equal conditions for all participants,
  - regulate and increase business efficiency in the activities of natural monopolies,
  - prevent abuses of market position,
  - improve service quality and
  - protect the position and rights of customers, especially small customers (households and small entrepreneurship).
- **Market formed prices of energy and energy commodities with the aim of creating conditions for economic viability of energy sector and attracting investments in the energy sector,**
- **Improving and refining the mechanism of help for vulnerable customers with the aim of gradual reduction of their number in interaction with development strategies in other sectors of the RS.**

Complete opening of energy markets, particularly electricity market, will change the principle of price formation in market activities. For the future free and market-oriented arrangement of the electricity sector is very important independent and effective monitoring.

**The RS Government will, in order to create the necessary preconditions, improve existing and propose new legislation to regulate the energy sector taking into account the principles of security of energy supply and environmental protection.**

Power market in the RS is part of the energy market in BIH and in Southeast Europe. Further empowerment and independence of Regulatory Commission for Energy of RS is consistent with the objectives of European energy policy.

**Regulatory Commission for Energy RS will intensively monitor and support the work of regional regulatory bodies and associations to facilitate the development of energy markets in the RS in accordance with European standards and promote the development and creation of regional energy market.**

The markets for electricity and natural gas in the RS will be open to all customers from 1st January 2015. The market and non-market activities in accordance with existing and future requirements of EU directives will be divided to facilitate effective supervision of regulated activities and non-discriminatory access to markets and customers. It will be prevented avoid cross-subsidies between regulated and market activities and various categories of customers. To all customers will be enabled quick, easy, cost-based and transparent change of supplier. To all retailers and suppliers must be provided access to cross-border lines based on market

and non-discriminatory principles, in accordance with European standards and regulations. These goals and measures will be achieved by the cooperation of the RS Government and other authorities in the RS and in BIH and the region - the regulatory commissions and agencies, companies for power transmission and transmission and distribution system operators.

Measures will be taken to inform the public about the real cost of production of all forms of energy, particularly electricity and heat. Using an appropriate regulatory framework and tariff systems will be gradually adjusted the price of all types of energy to a level that will enable the development of the market, attracting investment and private sector participation, particularly in the market activities of production and supply of different forms of energy.

District heating sector will be regulated by the appropriate adopted legal framework that will define the activities of this sector, especially regulated prices for production, transport and distribution of heat, in a way that will enable the economic viability and sustainability of these activities.

Other energy markets in the RS are already free and open (petroleum and petroleum products, coal and wood) and the prices of these fuels are formed on the free market.

The important role of the RS Government is in conquering poverty, which is one of the main priorities of the European Union. The problem of accessibility and availability of energy to the poor population has a significant impact on living standard, poverty reduction and overall economic prosperity. Opening of the markets and the inclusion of foreign and domestic capital will be developed to the limit where energy prices for some consumer categories reflect real costs.

**The RS Government will monitor the development and availability of energy infrastructure, availability of particular sources of energy, ability to pay the costs for energy and public thinking about the energy supply with the aim of evaluating the impact of energy market development on the social aspects and prevention of adverse impacts on certain groups of population.**

Energy consumption is closely linked with the economic life standard, so the RS Government will continue using and improving the mechanism to help vulnerable customers with the aim of more accurate determination of target categories of beneficiaries, determination of their energy needs and the further elaboration and application of various models of help. The analysis of the needs will be extended to all forms of energy and energy commodities and when needed helping mechanisms will be changed and adapted. The RS Government will appoint competent state institutions to review and refine the model, collection and processing of the necessary data. Improvement of the model will be implemented in cooperation with social partners.

**Government of RS will adopt goals and plans for the gradual reduction of energy poverty.**

The general increase in demand for energy affects the security of supply of various forms of energy and energy commodities. With the aim of increasing security of supply Government of RS, in cooperation with the authorities and energy market participants will work on the following:

- acceptance and implementation of European directives on the security of supply with electricity and natural gas,
- initiating research and exploitation of domestic reserves of oil and natural gas,

- promotion and implementation of mechanisms for utilization of renewable sources of energy,
- promoting and introducing mechanisms to increase energy efficiency and reduce losses at all levels of production, transportation, distribution and consumption of energy,
- promoting and introducing demand management measures, particularly in the electricity sector,
- introduction of mandatory operational and strategic reserves of petroleum and natural gas in its own system, or if it is not possible, in adjacent systems,
- connecting networked energy systems of the RS and BIH with neighboring systems due to the provision of new import/export and transit routes, the possibility of market exchange, the stable operation of the system and support in critical situations,
- adoption and implementation of mechanisms for managing emergencies in the energy supply,
- removing barriers to further investment in the energy sector, creating a positive climate for investment.



## 16. ENVIRONMENTAL CONTEXT, LIBERALIZATION AND REGULATION

Bosnia and Herzegovina, as UN member, joined in membership and/or is a signatory of international agreements in the field of energy, which oblige also the Republic of Srpska. **Energy Charter Treaty** which was signed by Bosnia and Herzegovina in 1995, and ratified the 2000 assumes the introduction of long-term energy cooperation in Europe in the framework of market economy, based on mutual cooperation between the signatory countries. It provides promotion of the development of trade in the energy sector on the basis of open and competitive market for energy products, equipment and services, removing technical, administrative and other barriers to trade in energy products, equipment, services and technology, encouraging modernization, renewal and rationalization of production equipment, transportation, distribution and use of energy, and improving access to capital through the appropriate financial institution.

In terms of promotion and protection of investments is determined creation of affordable, clear and neutral conditions for investors of other contracting parties, the constant care and security of investments and granting favorable and impartial process to foreign investors from other contracting parties equal to the domestic users. The goal of its Protocol on energy efficiency and related environmental issues is the promotion of energy efficiency policies consistent to sustainable development, creating the framework conditions that encourage consumers and producers to use energy economically, promoting cooperation in the field of energy efficiency and reduce the negative effects of the energy sector on the environment.

The signing of the **Treaty of establishing the Energy Community** in 2006, the European Union and nine partners in the Southeast Europe have created a unique legal framework for the organization of a common energy market in the region. The Energy Community aims to create a stable regulatory and market framework, and by the ratification of the Agreement it becomes part of the legal system of BiH and creates an obligation to adopt and implement EU legislation in the field of energy (electricity and natural gas), environmental protection, renewable energy sources and market competition. By joining the Energy Community it has been confirmed the cooperation with the EU power and gas sector and the development of competition in the energy market implementing common policies through the application of the Directive about electricity and natural gas markets, and through regulations on conditions for access to the network for electricity cross-border trade.

Directive 2003/54/EC concerning common rules for the internal electricity market contains rules for the generation, transmission, distribution and supply of electricity and the rules of the organization and functioning of the electricity sector, market access, criteria and procedures for the construction of power facilities and for the management of the systems. Directive 2003/55/EC on the rules for the internal market of natural gas, is intended to gradually open competitive national market in natural gas supply and enhanced security and improved level of competition in this sector. Directive sets out general rules on the storage, transfer, acquisition and distribution of natural gas, defines detailed rules on the organization and functioning of natural gas sector, including liquefied natural gas, biogas, and other types of gas. The Directive regulates market access, criteria and procedures for issuing licenses for transmission, storage, distribution and supply of natural gas and of system managements. Both directives are an integral part of the *acquis communautaire* in the accession to the EU, and additionally as a future candidate for EU membership, BiH is required to comply also with other EU directives.

Bosnia and Herzegovina, as a member of ENTSO-E (European Network of Transmission System Operators), is required to comply with the recommendations on the interconnected power systems of member states.

**United Nations Framework Convention on Climate Change** is not binding for Bosnia and Herzegovina, as it is not a member of Annex 1, or Annex B of **Kyoto Protocol**, and therefore there it hasn't been is not committed to reduce emissions of greenhouse gases in the first commitment period of 2008 to 2012. However, new agreement is in preparation on limiting emissions for post-Kyoto period (after 2012), and which is expected to include countries that are not members of Annex 1 of the UN.

Requirements of EU energy policy aims at achieving the 20% reduction of emissions of greenhouse gases in 2020 compared to 1990, 20% of renewable energy sources in gross final energy consumption in 2020 and 10% share of renewable energy sources used in all forms of transport in relation to final energy consumption in inland transport.

On the March 3, 2011 came into force new directives and regulations of the so-called *Third energy package* of the EU. These are: Directive 2009/72/EC of July 13, 2009 on the common rules on the internal electricity market; Directive 2009/73/EC of July 13, 2009 on the common rules on the internal market in natural gas; associated Regulation 714/2009/EC for electricity; 715/2009/EC for natural gas and Regulation 713/2009/EC on the cooperation of National Energy Regulators (ACER).

Upon coming into force of directives 2009/72/EC and 2009/73/EC directives 2003/54/EC and 2003/55/EC came out of force.

An important document that should be taken into account when harmonizing legislation with that of the EU is Directive 2009/28/EC from April 23, 2009 on promotion of the use of energy from renewable sources.

**In regard to the strategic commitment to joining of BIH into the EU, this Strategy can not ignore stated requirements. Rather, it will do everything necessary, while maximally respecting the specificity of RS, to develop the energy sector in line with these requirements.**

## 17. LEGISLATION

With the Statute of Bosnia and Herzegovina and the Statute of the Republic of Srpska, from which the jurisdiction of RS institutions for energy, primary sources of legal energy rights constitute the RS Law on energy as a key piece of legislation in the field of energy, laws regulating diverse energy sectors (the Law on Electricity, Law on Gas, the Law on oil and oil derivatives), the laws which stipulate the performance and regulation of transmission at the level of Bosnia and Herzegovina (Law on Transmission, Regulator and system Operator in Bosnia and Herzegovina, the Law establishing the company for transmission of power in Bosnia and Herzegovina, Law on the Establishment of an Independent System Operator in Bosnia and Herzegovina), laws regulating the concession regime for exploration and utilization of natural resources and construction of energy facilities (Law on Concessions and the Law on Public and private Partnerships) and subordinate legislation which deals with issues of tariff and licensing activities, relationships with customers, opening the energy market as well as acting of Regulatory Commission for Energy of the Republic of Srpska in the exercise of supervision of power, gas and oil market. Legal regulations governing the energy sector, define the legal status and powers and responsibilities of institutions in charge of development and planning, operation, regulation and supervision of RS energy sector.

Treaties signed by Bosnia and Herzegovina which are concluded, approved and published in accordance with the constitutional laws and in force, are also part of the legal system of BiH, i.e. RS, regulating energy sector. With the Energy Charter Treaty and its Protocol on energy efficiency and related environmental problems (PEEREA) that Bosnia and Herzegovina signed in 1995 and ratified in 2000, and which assumes introduction of long-term energy cooperation in Europe, taking into account the protection of the environment, the CEFTA agreement signed in 2006 by which the parties undertake to establish a free trade area in accordance with relevant rules and procedures of the WTO and the Agreement on Stabilization and Association signed in 2008 in which is confirmed the status of BiH as potential candidate for membership in the European Union and cooperation in the energy sector, focusing on the priorities of the legal heritage of the EU in the field of energy. To create a legal and institutional framework of the Republic of Srpska energy sector based on the principles of effective regulation and liberalization of the sector, and to improve freedom of competition, secure of supply and environmental protection, of special significance is the Treaty Establishing the Energy Community signed in 2006 in which Bosnia and Herzegovina and the Republic of Srpska are committed to implement the *acquis (acquis communautaire)* of the community in the field of energy, environment, competition and renewable energy.

In accordance with accepted international obligations, the Republic of Srpska needs to implement in the legal framework legal solutions contained in the heritage of the EU and to build and to harmonize its legal framework with the requirements and recommendations of the European Commission, taking into account its own specific characteristics and economic and social development.

Thereby the need remains, by energy laws foreseen, to implement regulations that will define some existing, but also new relations in the energy sector (district heating sector, renewable energy and energy efficiency), strengthen and specify the roles and duties of certain institutions and entities, than consistently implement the requirements of the legal heritage of the EU on the issue of security of supply, unbundling, public service obligations, consumer protection, etc.

Normative activities in the legislative framework necessary for the realization of strategic and operational objectives of the energy sector in the RS to be taken, bearing in mind the international obligations and restrictions that can not be eliminated by normative changes are as follows:

- 1) Implementation and improvement of the existing legal framework and the harmonization of the legal framework with the *acquis* of the EU for the energy, sector including the so-called "Third energy package".**
- 2) Legal regulation of the sector of district heating, i.e. of the conditions of production and distribution of heat, security of energy facilities in this sector, the status of producers and qualified producers of heat.**
- 3) Adoption of a comprehensive legal and institutional framework for the field of renewable energy sources and efficient cogeneration by enacting legislation on renewable energy sources that would with unique approach regulate area use of renewable energy sources and supporting mechanisms or by adopting already planned, by-law legislation which will regulate the system to support use of renewable energy and cogeneration, and way of securing and use of financial incentives and the institutional structure for the operational implementation of the system of incentives. By adopting the same, it is suggested as soon as possible adoption of the concept by which law on renewable energy sources would represent a comprehensive way of dealing with issues in this area.**
- 4) The adoption of special law to regulate the efficient use of energy in final consumption, the implementation of programs, plans and measures to improve energy efficiency, energy services and energy audits, duties of the public sector, energy companies and large consumers, consumer rights in application of measures of energy efficiency and standards and criteria in the construction of buildings, in the direction of achieving energy efficiency, particularly in terms of heat savings and, consequently, reduction of emissions of greenhouse gases.**
- 5) The creation of legal prerequisites for performing the functions of development and implementation of programs and projects and the implementation of incentive systems in the field of renewable energy sources, efficient cogeneration and energy efficiency by assigning these functions to the existing Fund for Environmental Protection or by establishment of new institutions/fund for RES and EE.**
- 6) In order to facilitate the implementation and rising of the standards of environmental protection, adoption of bylaws in accordance with the Law on the Protection of Water, Land and Air.**

## 18. RESTRUCTURING

Approach to the restructuring of energy sector of RS will link to the global process of deregulation and liberalization of EU energy sector, i.e. with overall changes in energy sectors that condition this process.

Consequently, restructuring of the energy sector of the RS, mostly covers "adoption and implementation of obligations under the Treaty establishing the Energy Community." It's about concrete and comprehensive actions in the implementation of the strategy in period to 2030, which is related to the fact that the implementation of the Treaty, in fact, implies the harmonization of national legislation with EU legislation, through the mechanism of "legal heritage." Action plan for implementation of this strategy, among other things, defines the activities, deadlines and responsibilities on restructuring the energy sector of the RS, which is a good basis for a proactive approach, in terms of recognizing the **real interests of the RS energy sector and mechanisms for their implementation within the Energy Community.**

Bosnia and Herzegovina has committed, through the Energy Community Treaty, to implement the second package of directives on energy sector reforms, which determines the minimum level of institutional organization of energy companies, especially those dealing with the regulated activity. Soon that obligation will extend to the third package of directives, which emphasizes even more the position of regulated activities and their independence and separation from other market activities. One of them is a power transmission. The current state of organization through two companies: System Operator, NSO and Elektroprenos (transmission company), meets the criteria of institutional organization arising from the second and third directives, but there are problems in their functioning.

Strategic interest is that NOS and Elektroprenos function in the interest of development of power transmission network, security, market development and customer needs. Improving the efficiency of functioning of the transmission system is possible by supplementing the statute and eliminating management problems to achieve the necessary managerial responsibility that would accompany the development of network and customer needs. This means boosting the responsibility of the transmission areas for investing in a 110 kV depending on the needs and revenues and shared responsibility for developing a network of 220 kV and 400 kV.

Intentions of the third package of directives go in the direction of establishing a single energy market in the EU, which means that the licenses issued in any member country are valid in other states. In further process it expects the BIH also, primarily to be a single energy market in BIH, and then synchronized with the EU. This means to separate social policy in the energy sector of the market laws and to development a special social system to help consumers who can not pay the social costs of energy consumption.

The present system of regulation takes place at two levels, state and entity. The current authorization should be maintained in the future, and further construction of the regulatory framework should be harmonized and aligned with EU directives.

The direction of development of reform in the EU is toward clearer institutional and organizational positioning of the distribution networks as a public service and separate from the activities of market sales of electricity. The current division of the five distribution companies with ownership share of 65% by the RS is not an obstacle to reform and is recommended to keep it. Changes in ownership structure in the transitional period, until the real economy in energy is achieved, in all countries of Central and Eastern Europe have not brought the expected results, the conflict between the interests of the new owners, on the one hand, and the interests and obligations of the state, on the other side, has been deepened.

Briefly put, the activities of the restructuring of the energy sector will comprise three main categories:

- Normative changes,
- Organizational changes,
- Ownership relations in energy sector.

**Normative changes**, as already stated, are related to continuous monitoring, adopting and implementation of obligations under the Energy Community Treaty, in the direction of maximum harmonization with EU legislation. It is necessary to be familiar with directives, short and long term goals and conceptualize own legislation avoiding the most common error of literally copying legislation, without real understanding of the intentions and goals. Legislatively regulated system is the precondition for arrival of serious investors.

Throughout the period till 2030 Republic of Srpska will follow and accept the new requirements and recommendations of the European Commission, taking into account the particularities of the domestic market and the need to ensure sustainable economic development of RS.

**Organizational changes**, with respect to the achieved level of horizontal integration in different energy sectors and the existence of independent regulatory bodies, are essentially connected with the legal separation of distribution system operators on the energy market from other activities and with the design of the system of subsidizing and encouraging renewable energy and energy efficiency in the sector.

**Ownership relations** in the energy sector will continue to be based on non-discriminatory relationship to certain forms of ownership, which means avoiding favoring the public interest in relation to private and vice versa. For this is necessary to have a vision of all relations in the energy sector, involving the ownership relations, in order to make the right decisions.

Realization of strategic choices in restructuring the energy sector will result in significant changes in the energy sector of the Republic of Srpska, related to:

- |   |
|---|
| <ul style="list-style-type: none"><li>• the structure of energy resources, in terms of strengthening the share of renewable sources,</li><li>• market opening,</li><li>• security of supply,</li><li>• energy efficiency and</li><li>• protection of the environment.</li></ul> |
|---|

Special emphasis is on solving the problem of emissions of greenhouse gases, creating the conditions for unlimited and free trade of all kinds of energy forms and the safe and continuous supply of energy at a defined quality standards for the welfare of its citizens, using the usual international experience and a valid international (especially EU) legislation in this area.

Restructuring of the energy sector is extremely important phase of its organization and should be implemented **determinately**, because the obstructions are in existing companies. As a serious problem appears the deficit of knowledge on future energy relations and mode of functioning of energy markets. The restructuring is to be done before any activity that could be related to the privatization process.

Constantly adjusting its regulatory framework with the EU *acquis*, the Republic of Srpska will create and strengthen the preconditions for the smooth functioning of energy market, introduce a clear, applicable, transparent and non-discriminatory rules in the energy sector, enabling, in this way, long-term sustainable development of energy sector.

## 19. PRIVATIZATION

### The current state

In the previous period there have been structural, legislative and ownership changes in the energy sector, differently by sectors. The biggest changes are in the oil sector, where refineries were privatized, and all retail is privately owned. In the electricity sector, which is based on domestic resources, the situation is as follows:

- Power utility partially privatized.
- Transmission outside the power utility is in ownership of entity.
- Issued approvals to build thermal power plant and concession for one larger and a number of smaller hydro power plants, without obligation to sell energy to domestic customers.
- Thermal power plants are old, with low efficiency, additional investments are needed.
- Electricity prices are not market realistic, reduced financial ability of power utility in launching development and in major reconstruction of production facilities and networks.

The most important decisions with regard to development, and ownership, shall be adopted for the electricity sector.

### The steps in the legislative, organizational and economic regulation of the energy sector

The energy sector, i.e. its major elements, energy and technology, should have a price that is verified at world's level. This should be a key motive of all activities in the energy sector. It applies to regular business, the opportunity for development and, in future, the privatization.

The ultimate goal of all activities in the energy sector is a long-term secure supply of energy at reasonable costs. The ownership in energy sector is a question of long-term national interests, what is needed, and not contrary to European practice, should be state owned and the rest is better to be entrepreneurial interest. Thus, the regulated activities are natural to be state owned, while the market activities are desirable to be in the sphere of interests of entrepreneurs.

### Economic arrangement and achieving the market price of energy

Achieving real economic price of energy and arrangement of social policy, which would assist those households that have difficulty paying energy, is a necessary step and it is desirable to do it as soon as possible. This includes bringing in order paying costs for received energy. Key emphasis is on making every energy customer to pay their costs. For the realization of this step, the RS government has the necessary political will and determination to give the energy sector the chance of normal functioning.

Historical attempts to make the energy price social for all energy consumers in all former communist countries have proved to be poor, with severe consequences for the energy sector. There is no alternative to the real price of energy, of course, with well-organized social program.

Privatization is the last step in regulating the energy sector and it is not necessary for the implementation of the "legal heritage" of the EU. Previously, it is necessary to essentially arrange the sector in terms of its deregulation, liberalization and commercialization, and choose the most favorable moment for RS for privatization. Of course, the controlled introduction of private capital in the energy sector of the RS is preferable because of its proven

efficiency and effectiveness, and it does not have to be sale of shares owned by the Republic of Srpska, since, in this respect, various forms for constructing new energy facilities are available, such as public-private partnerships, concessions, joint ventures etc.

Another issue is the dynamics of privatization and the content of privatization. That is of special importance for a country in transition. It is necessary to have a vision of total relations in the energy sector, including ownership relations, in order to make the right decisions.

Potential investors, in general, advocate rapid privatization when the price for them is low, a return of capital fast. For example, the sale of distribution is forced, although it is clear that the distribution system operator and the supply (sale) of electricity will have to be separated. This is to protect the monopoly of the new owner. Achieved prices of sales are usually not more than the price of the average meter connection (reduced to individual consumer). The privatization should take place as well controlled process with clear goals.

### **How to choose the best business strategy?**

#### **1. One of the highest priorities is to define clear and achievable business goal.**

This requires a good knowledge of the value of the project and to have a vision of the electricity market development, particularly in terms of changes that will occur due to climate protection.

In order to set a good business goal, it is necessary that the basic project documentation on any energy project is owned by RS or by companies owned by the RS. In terms of this, it is desirable to bear in mind that the business interests are wider than the sale of energy itself outside the RS, particularly in terms of a positive effect on future performance of companies in the RS and standard of citizens. Additionally, it is necessary to:

- See new construction or revitalization as a part of a unified concept of privatization and financing.
- Consider the option of construction of hydro power plants with foreign partner with 50%:50% ownership.

#### **2. Why build hydro power plants and what are the possible benefits:**

- a. activation of economic potential,
- b. the fee to water resources management for protection of water, population and commercial properties
- c. the fee to local self-government for the use of territory,
- d. the fee for the use of hydro potential, concession fee which depends on the market value of the plant. The value of a power plant is determined by the characteristics of water flow and characteristics of location that include usable head and the ability to form accumulation,
- e. taxes and contributions in the construction phase of power plant,
- f. employment of domestic industry and construction firms in the construction phase,
- g. taxes and contributions in the phase of using plant,
- h. employment, but not great, since the matter in question are hydro power plants,
- i. work on maintaining power plants and hydraulic structures,
- j. possible infrastructural facilities in the construction phase of hydro power plants,
- k. production of electricity,
- l. it is a renewable energy source.

#### **3. Decide on what are the primary business interests:**

- a. short-term financial interest,
- b. long-term financial interest,
- c. energy interest,
- d. a combination of energy and financial interests.

#### **4. Important remarks for successful project implementation:**

- a. From the start, project should be treated as a profit project.
- b. The investor comes to achieve their business interests.
- c. The investor is aware of its advantages - organizational, financial, credit rating, so will all its advantages try to charge well.
- d. The price of energy must be market-based, because the project must be cost effective. No bank will finance it if there is no market potential.

#### **5. The choice of business interests will determine the character of the relation between RS and investor.**

- a. The most complex relationship is a combination of energy and financial interests. The best solution is a co-ownership of a company that will prepare the construction of hydro power plant, to lead the construction and operation of power plant. The optimal solution is 50% RS and 50% Investor. The investor may also request 51% in order to decide if there is no consent. A combination of 50%:50% is possible and that the investor has the final word on matters of construction management and operation of power plant, and on all other issues the consent of both partners is needed.
- b. 49%: 51% in favor of investor, but the questions that need to be agreed are determined, the final technical solutions, the engagement of domestic industry, relationships with the local community.

#### **6. An important issue is to assess the business interest of investor**

A legitimate attitude of investor is that he wants all the benefits for himself, including the disposal with green certificates for the total amount of energy, because of the problem of climate changes and commitments in their own country. It is questionable how this corresponds to the RS, although it could be very attractive financially. Namely, the RS will also have a portion of obligations within the obligations of BIH, for climate protection.

**To achieve favorable arrangement, one should be familiar with the market value of power plants that are included in the project. It is also important that the RS participates in the sharing of power plant production, regardless of whether it will use this energy for its own use or for the market. Depending on the type of arrangement, it should also consider pre-emptive rights to buy, if the entire project is market-oriented. A solution in another direction is also possible, that investor requires the pre-emptive right to buy.**

**In the process of granting concession for the construction of energy facility, the introduction of so-called one-time fee can be considered, which the potential concessionaire would pay to the grantor, and by which the grantor would finance the preparatory activities for the evaluation of energy potential and public interest of individual project. One-time fee would be taken into account when defining the concession fee.**

## 20. FINANCING

The mutual conditionality and compatibility between the energy sector development and development of economy as a whole is indicated by numerous economic reasons. Continuous increase in energy demand primarily requires intensive investments in energy sector, which represent a substantial part of accumulation of capital of public and private sector in the Republic of Srpska. It is important for society to ensure the growth of energy capacities, taking into account the needs of energy consumers and financial possibilities of society. Therefore, the growth of the energy sector capacity in RS is associated and conditioned by the economy development and cannot be observed separately from economic and social trends in the RS.

The economic relation to the capital in the energy sector of the RS determines, on one hand the possibility of renewing the existing and building new power plants and facilities, and promotes interest in investing in energy-related activities on the other hand. For the stable functioning of the energy sector is therefore of importance to establish and maintain financial stability and business success of energy activities, using own and external sources of funding, so that the project financing is structured in a way that ensures market justification and viability.

The quality of each source of financing of investments is determined by two factors:

- the availability of funds and
- cost of using resources.

In between these two elements, capital availability and cost of capital used in financing energy sector development, occur all the positive and negative effects that the used capital can have in liquidity, security, profitability and stability of operation and development of individual companies in energy sector.

How to achieve financial stability and business success of energy activities, and to thereby realize the targeted objectives:

- providing funds for the development of energy sector
- rationality in the construction and exploitation
- stimulation of the choice of optimal place, time, intensity and method of energy form consumption.

The solution is to set up a stable system of determining economic level of price of energy form and tariff system for the sale of energy form, which would:

- express all the characteristics of the energy sector,
- provide stable conditions for financing the development and operation of energy activity,
- stimulate the rationality in the business,
- create the conditions for entrepreneurial activity in the energy sector and at the same time
- stimulate the choice of optimal place, time, intensity and method of consumption of certain forms of energy.

A large-scale development and investment cycle in energy sector is in front of RS. It is estimated that to achieve the Strategy the value of total investments in the energy sector of the RS in the

period from 2010 to 2030 amounts to about 11.2 billion BAM (€ 5.75 billion) in current prices (Table 5).

**Table 5. Investment plan in the energy sector of the RS from 2010 to 2030**

Programs of energy sector development		Amounts in millions BAM					
		Period of investment					
		2010 - 2015	2016 - 2020	2021- 2025	2026 - 2030	Total investments	%
1	Power sector <sup>1</sup>	2832	1397	675	378	5282	47.2%
2	Coal sector	619	51	-	-	670	6.0%
3	Gas sector	151	161	118	80	510	4.6%
4	Oil sector	1091	180	-	-	1271	11.4%
5	District heating sector	282	145	90	-	517	4.6%
6	Renewable energy sources	233	240	466	766	1705	15.2%
7	Energy efficiency	254	267	329	375	1226	11.0%
<b>Total investments</b>		<b>5462</b>	<b>2441</b>	<b>1678</b>	<b>1599</b>	<b>11180</b>	<b>100.0%</b>

\*Amounts in millions BAM

<sup>1</sup>investment projects in renewable energy sources are not included in power sector

RS does not have its own accumulation of capital of such level so it will have to look for these funds at the international capital market. The overall effects of investing in the energy sector will depend primarily on ways of financing energy facilities, because these are long-term, complex and financially demanding programs and projects. The RS government will prefer a model of investment financing in the energy sector which contributes to achieve the main objectives of economic policy (GDP growth, low unemployment, low and stable inflation, positive foreign-trade balance) and brings allocation of business risk between domestic and foreign investor.

Due to the inability to predict with certainty the economic movements in the period covered by this Strategy, a comprehensive rating of its overall economic and financial effects will be carried out before taking individual investments envisaged by this Strategy, especially as it comes to investments that can by its amount and importance significantly affect the most macroeconomic variables in the RS.

The structure of future investors is difficult to assess because the majority of investments will be left to the market. Although various financing models of Strategy implementation are therefore possible, in order to estimate the economic effects of the Strategy it is necessary to assess what level of investments will take domestic, and what foreign investors. The largest interest of foreign investors is expected in investments in power sector, while, for now, in other investments lower foreign investing is expected. It is envisaged that domestic investors will partly finance investments using achieved accumulation, and partly using loans (in domestic and foreign capital markets), where in this moment it is difficult to estimate what will be the ratio between these two sources.

One must conclude that, in order to be able to finance the necessary investments in the energy sector, it will be required to:

- potential local investors achieve positive cash flow in their business, because only the cash incomes can be the basis for investment decisions, or
- that foreign investors implement greater direct investments.

In both cases, energy prices will have an important role, because domestic investors, without increase of energy prices (market energy prices), would hardly be able to achieve greater accumulation of capital, and also foreign investors could be attracted to the market of RS only by higher energy price.

In order to increase the credit rating of projects in energy sector, incentives for investors, stimulation of energy efficiency, stimulation for using renewable energy sources, stimulation of the protection and improvement of environment and others, the RS has decided for a gradual introduction of market energy prices.

In conditions of high sensitivity of energy prices and possible increase of prices due to adjustment of tariff system with the system of European Union, achieving an adequate increase in energy prices in the domestic energy market will represent a major challenge for economic policy makers.

## 21. EDUCATION AND INTERNATIONAL COOPERATION

Good organization of universities in the Republic of Srpska and the existence of a sufficient number of faculties and secondary schools for the training of personnel in the energy sector are adequate basis to supplement existing curricula activities for the advancement in monitoring the latest trends and acquiring new knowledge. This primarily refers to renewable energy sources which are becoming increasingly important in energy production and the second most important area in the RS in the beginning phase - the area of energy efficiency. In the field of renewable energy, energy efficiency, research and exploitation of mineral resources and the implementation of new technologies in energy sector, according to European directives and the potentials of RS in the coming period will be needed around 1 000 highly skilled experts in relevant scientific areas and about 250 technicians from various fields.

Educational development platform for the field of renewable energy and energy efficiency will have the following steps / guidelines:

- Defining the institution in which groups of pupils/students (various directions in the educational program) would be nominated for appropriate system of education in renewable energy and energy efficiency,
- Training of teachers/professors/lecturers by experts from institutions dealing with the aforementioned themes (national/international experts),
- Organization of the appropriate schedule and educational content, with clear guidelines and supposed results for all types of education,
- Modernization of teaching - besides traditional lecturing is important to show students the real models or organize study visits to relevant institutions or existing facilities where relevant topics could be presented.

At the level of primary and secondary schools should also be provided basic knowledge about the areas of renewable energy and energy efficiency. In high school for civil engineering should be introduced a new program that would specifically deal with renewable energy and energy efficiency.

On the energy and engineering studies it is necessary to complement existing training programs with new contents on renewable sources and energy efficiency. Given that the protection of the environment is becoming very significant area, it is suggested formation of a special study or orientation on the energy study (like: Energy and environmental protection/Environmental engineering), which would deal with the analysis of technical and physical-chemical processes occurring in power plant and leading to the emissions of pollutants into the environment.

As a complement to existing programs is proposed introduction of additional programs with an emphasis on increasing use of renewable energy sources, but also increase energy efficiency in buildings. These programs can open the Ministry of Education, but also institutions and professional associations that have sufficient knowledge about new technologies. Starting and funding of these educational programs can be provided from European funds and programs. Users of complementary programs would be regular students, technicians and qualified teaching staff. For a better learning of new technologies it is proposed to establish a regional center for renewable energy and energy efficiency which would present their typical application. The center would organize seminars with expert speakers for the various target groups: teachers, professors, students, and already qualified technicians and engineers, as well as for general public.

In the field of international cooperation will be initiated more active engagement regarding application of potential projects in international programs, thus institutions could be as soon as possible be introduced and adjusted to the EU mode of work and to the EU legislation, which would facilitate easier entry into the EU. These programs also provide a great opportunity to encourage progress and obtain technical and financial assistance in all aspects of social development. Given the many similarities and common problems also can be very useful bilateral cooperation with other countries in transition, in order to utilize the positive experiences and solutions, and avoid possible mistakes. Furthermore, it is certainly of interest as well the cooperation with most developed countries, which can be initially implemented through training of experts, joint research projects, and then through the launch and implementation of joint demonstration projects. In this sense, for the Republic of Srpska establishment of the Energy Agency could significantly enhance this international cooperation and transfer of knowledge and new technologies.

## 22. PUBLIC, INFORMATION AND CONSULTATION

The strategic interest of each country is to have informed public that may well contribute in discussions on the development of energy sector.

For making all important decisions in the energy sector, especially those that have an impact on the environment, it is necessary today to involve the public in the decision making process. By accepting international conventions (such as the Aarhus Convention<sup>2</sup>, which was ratified by BiH on 1st October, 2008) and by establishing the legislation in this area is necessary to regulate the manner of public information and participation.

With the aim of faster harmonization of RS with European directives and achieving full implementation of existing regulations in force, in part related to better public information and involvement, it is necessary to perform the following:

- initiate action on the nomination of the focal point and make an action plan for implementation of the Aarhus Convention,
- implement activities related to the publication of the Register of pollutants and make it publicly available,
- information on the assessment of risks to the environment make publicly available,
- prepare an act regulating the establishment of a system for management and control the environment,
- prepare regulations for the Strategic Environmental Assessment of the environmental impact and make it publicly available (currently available on request),
- prepare an act regulating the production of a report on the state of nature and make it publicly available,
- prepare an act regulating the production of the Register of protected areas and make it publicly available,
- regularly monitor the changes of European directives in order to better inform and involve the public and work on a permanent legislative alignment.

For preparation of the Strategy were identified interest groups, which will in the scope of their work, responsibility and accountability have a greater or lesser role in the adoption and implementation of strategy, as well as other documents (programs, action plans) and projects that will be based on the Strategy, so the methods of communication with them are proposed.

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<sup>2</sup> Convention on access to information, public participation in decision-making and access to justice in environmental matters

<b>Target group</b>	<b>Government</b> <b>Regulatory agencies</b>
Method of communication	<ul style="list-style-type: none"> <li>▪ Direct written information, with instructions on where it is possible to find any additional information.</li> <li>▪ Consulting meetings.</li> <li>▪ Focus groups.</li> <li>▪ Thematic meetings.</li> <li>▪ Negotiation process with stakeholders crucial for the project.</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Information about the certain issue / decision that needs to be made (subject, purpose, general aims).</li> <li>▪ Collect detailed information on specific interests and attitudes or open problems in the sectors that are the responsibility of government, and that can be influenced by the final decision.</li> <li>▪ Presentation of existing and proposals and collection of new proposals and alternative solutions to a problem.</li> <li>▪ Testing the acceptance of already defined options.</li> </ul>
<b>Target group</b>	<b>Governmental and local agencies</b>
Method of communication	<ul style="list-style-type: none"> <li>▪ Direct written information or publishing information which is intended for this target group.</li> <li>▪ Workshops of visioning and development of community.</li> <li>▪ Focus groups with target groups of participants</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Information about the certain issue / decision that needs to be made (subject, purpose, general aims).</li> <li>▪ Collect suggestions and alternative solutions to a problem.</li> <li>▪ Joint decision making on the vision of community development.</li> </ul>
<b>Target group</b>	<b>Profit sector</b>  (Participants who have a prominent role in the energy market and on which decisions can have direct and indirect effects)
Method of communication	<ul style="list-style-type: none"> <li>▪ Information on issues and activities through flyers, advertisements and special supplements in the print and electronic media.</li> <li>▪ Semi-structured individual interviews and group and individual consultative meetings.</li> <li>▪ Thematic Conference.</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Information about the actual issue / decision that needs to be made (subject, purpose, general aims).</li> <li>▪ Gather information about the attitudes, interests and concerns in the profit sector.</li> <li>▪ Incentives to discuss current problems and possible solutions.</li> </ul>

<b>Target group</b>	<b>NGO Sector</b>
Method of communication	<ul style="list-style-type: none"> <li>▪ Information on issues and activities through public media, forums, etc.</li> <li>▪ Individual and group consultative meetings.</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Information about the actual issue/ decision that needs to be made (subject, purpose, general aims).</li> <li>▪ Gather information on attitudes about the current problem.</li> </ul>
<b>Target group</b>	<b>Experts</b>
Method of communication	<ul style="list-style-type: none"> <li>▪ Thematic Conference to achieve consensus on an issue,</li> <li>▪ Individual and group consultative meetings.</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Achieving consensus on the most acceptable solution of some key issue / aspect of the decision.</li> <li>▪ Professional soundness of the final decision.</li> <li>▪ The legitimacy of the final decision.</li> </ul>
<b>Target group</b>	<b>Population in the vicinity of energy facilities</b>
Method of communication	<ul style="list-style-type: none"> <li>▪ Survey (telephone, electronic, written, live), referendum (local or national), local information points.</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Information about the current problem / decision that needs to be made (subject, purpose, general aims).</li> <li>▪ Gather information about the attitudes, interests and problems faced by local populations.</li> <li>▪ Respect for views of the local community when making the final decision.</li> </ul>
<b>Target group</b>	<b>General population</b>
Method of communication	<ul style="list-style-type: none"> <li>▪ Information: leaflets and brochures, information points, ads and articles in print and electronic media, telephone information service.</li> <li>▪ Public discussion, web pages, contacts and interviews show.</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Information about the current issue / decision that needs to be made (subject, purpose, general aims).</li> <li>▪ Collecting views and comments on the proposed solutions.</li> <li>▪ Taking into the consideration of the relevant public attitudes and comments for the final decision.</li> </ul>
<b>Target group</b>	<b>The international community</b>
Method of communication	<ul style="list-style-type: none"> <li>▪ Web site of the project, cooperation through the organization of seminars and presentations and publications.</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Information about the current problem / decision that needs to be made (subject, purpose, general aims).</li> <li>▪ Collect opinions and recommendations.</li> </ul>

<b>Target group</b>	<b>Media</b>
Method of communication	<ul style="list-style-type: none"> <li>▪ Press releases and press conferences, advertisements and articles in print and electronic media.</li> </ul>
Goal	<ul style="list-style-type: none"> <li>▪ Timely transfer of accurate information to as many members of target groups.</li> </ul>

In many developed countries and developing countries, an important role in informing the public have the energy agencies and counseling centers that provide technical and scientific support to the ministries, governments, regional and local self-governments and other stakeholders in the energy sector. The tasks of the national energy agencies typically include preparation and implementation of energy policy, with particular emphasis on renewable energy (since these forms of energy are not yet fully commercially viable) and energy efficiency, preparation of legal documents, plans and programs, professional consulting services for producers and distributors of energy and energy regulatory agencies. In addition, one of the important roles of the agency is establishing cooperation with institutions that operate in other sectors to encourage cross-sector integration.

Bearing in mind the above mentioned and based on the analysis of several existing agencies in the region, as well as specific conditions in the RS, it is proposed to establish Energy Agency of the RS according to the following model:

- **the establishment of agency, as legal persons and non-profit organization, governed by law,**
- **by the law define tasks of the agency authorities, acts, and the way of financing,**
- **it is suggested that the activity is related to:**
  - **the establishment of counseling services in energy sector,**
  - **distribution of information on energy efficiency,**
  - **possibility of using renewable energy sources,**
  - **public education,**
  - **exchange of knowledge and experience in the field of energy,**
  - **international cooperation and participation in international, regional and local projects.**

According to the experiences of numerous energy agencies in EU countries, the key factors for success are as follows:

- *Autonomy:* Each agency should be neutral, independent and autonomous body with its own budget and permanent staff, but should also be supported by public administrations (national, regional, local),
- *Partnership and collaboration:* Agencies should work closely with representatives of public administration and public representatives in the area where the certain project is implemented, but also with individuals which participate in the energy market,
- *Long-term liabilities:* the existence of long-term political and financial support to local and regional government agency and its activities,
- *Communications:* Agency generally must advertise the offered services, and it is necessary to implement the wider dissemination of results and current activities.

## 23. SWOT ANALYSIS OF ENERGY SECTOR OF REPUBLIC OF SRPSKA

### Strengths

- Availability of natural resources – coal and hydropower
- A balanced portfolio of power plants (hydro/thermal)
- Power generation exceeds domestic consumption – security of supply
- Large capacity of electric power transmission lines and good connections to neighboring systems
- Progress made in implementing the legal legacy of the EU and international agreements (deregulation and liberalization of the sector, horizontal integration, etc.), particularly in the electricity sector
- Established Regulatory Commission for Energy sector of RS
- Adopted laws regulating the activity of power transmission, the energy sector as a whole, the energy sectors (electricity, natural gas, oil and oil derivatives) and the concession regime for exploration and utilization of natural resources and construction of energy facilities.
- Adopted by-laws for the electricity market which regulate in detail the conditions governing the power sector (license), the status of qualified producer, access and connection to the distribution network, the status of eligible customer, the conditions of supply of electricity to the end customers and some by-laws for the gas market.
- The existence of regulations on environmental protection and its compatibility to a large extent with the European standards
- Ratified Aarhus Convention
- The upward trend in student's number in electrical and mechanical faculties since 2008 (due to government incentives for the entry in short study programs).

### Weaknesses

- Old plants and low efficiency of thermal power plants
- Old electric power transmission lines and partially obsolete equipment
- The low selling price of electricity in the domestic market (regulated prices)
- Negative impacts on the environment (high emissions of noxious substances in the combustion process)
- The need for opening new coal mines (existing reserves are near the end)
- Lack of economic confirmed domestic sources of crude oil
- The lack of studies of domestic coal reserves
- Lack of economic confirmed domestic sources of gas
- Lack of close foreign sources (springs, gas-pipelines)
- Inadequate or undeveloped regulation for energy efficiency in building sector, energy certification and use of renewable energy sources
- Lack of Entity agency for energy efficiency in buildings
- Lack of national programs and pilot projects to increase of energy efficiency in buildings
- Low capacity of the ministries in relation to the required dynamic energy sector reform in RS

- Lack of funds for investment and a large dependence of development from international sources of funding
- Status of district heating sector (normative regulation and control) is not clearly defined.
- Normative and institutional framework for the promotion of renewable energy sources, efficient cogeneration and energy efficiency has not been established yet.
- Legal regulation of the sector of gas, petroleum and petroleum products is not complete yet
- Lack of energy agencies, ESCO companies
- An insufficient number of experts in the energy sector, particularly those dealing with energy efficiency and renewable energy sources and the lack of teaching staff at technical faculties
- Lack of awareness of the general public on energy issues

### **Opportunities**

- Export of electricity
- Increasing production of existing power plants (rehabilitation and/or reconstruction)
- Construction of new power plants (thermal and hydro, renewable, small power plants)
- Unsaturated gas market and the possibility of partial replacement of existing fuels with gas
- Construction of new pipelines (South Stream)
- The existing capacity for processing oil are only ones in BIH
- Modernization and increasing refinery capacity
- Attracting investments
- Development of regional energy markets and integration into the single European energy market (Energy Community)
- Development of new technologies in the production and transmission/ transport of energy
- Use of pre-accession EU funds and other international programs to acquire new skills and achieve international cooperation in the implementation of modern projects in energy sector and education
- Establishment of international cooperation with international bodies and organizations in the energy sector with the aim of additional education of experts
- Attracting investment in the education sector for energy through cooperation projects with industry

### **Threats**

- Partial exposure to electricity prices in the open market (the uncertainty of revenue)
- The required investment in the development and rehabilitation of power transmission networks
- Exposure to gas prices on the open market and dependence on imports
- Rising oil prices and the decline of world oil reserves
- Undeveloped energy efficiency and renewable energy market
- Comply with existing and future regulations on environmental protection, limiting air emissions (SO<sub>2</sub>, NO<sub>x</sub>, CO and particles), emissions into water, noise, waste generation, etc., may require installation of expensive technology
- Continuous political instability in the environment and problems in the functioning of the BIH
- Inadequate regulation of the energy market in Bosnia and Herzegovina

- Lack of awareness of importance of education and international cooperation as a key strategic areas
- Lack of funding agencies / counseling and campaigns for better information of public

## **24. MONITORING OF IMPLEMENTATION AND NEEDS OF ADOPTION OF STRATEGY**

Implementation of the Energy Policy and Planning of the energy sector development of Republic of Srpska, determined by the Energy Development Strategy of the Republic of Srpska demands measures and activities, i.e. effective mechanisms that would be in function of implementation of the Strategy, i.e. of monitoring and evaluation of realization of all the concrete tasks of the adopted strategy.

In that sense there is a need for systematic monitoring of the implementation of development goals and activities of individual energy sectors, the priorities, fulfilling of the defined energy needs, resources and ways of providing the required amount of energy and other tasks set within the strategic goals.

In order that the Government of the RS, the relevant ministry and all other bodies perform their constitutionally and legally prescribed tasks in the field of energy, it is necessary to regulate systematically performance of energy statistics, make energy balances for the previous year(s) and for the next year. With special act (by-law on energy balance) should be regulated keeping and reporting obligations on the state of the energy sector. Ministry responsible for energy will coordinate all activities.

When we talk about energy statistics, it is primarily related to a system of collecting energy data whose analysis could make the energy balance in the form or standard defined by the IEA/ Eurostat /UNECE.

The process of making the resulting energy balance should be organized in several stages:

- Data collection,
- Analysis of data
- Construction of individual energy balances and complex energy balance based on the results of the analysis.

Responsibility for implementation of the Strategy is the responsibility of the Government of the RS, which was given an obligation to create a framework for effective achievement of the stated goals through action plans for the implementation of the Strategy.

In accordance with the said Government of the RS in action plans define measures, stakeholders and deadlines for the realization of energy policy, as well as a way of achievement of cooperation with the organs of local self-government in the energy sector development planning and cooperation with energy companies in the sector of electricity, gas, oil and with other entities in Bosnia and Herzegovina and other international institutions. The action plans include measures for the implementation of energy strategy that can be divided into several groups: organizational, business, measures of restructuring, technical measures, financial measures, energy efficiency measures, educational, informational, advisory, and promotional measures.

Action plans are the main instrument of planning, coordination and monitoring of implementation of the Strategies for energy development.

The need for setting up an institutional framework for monitoring and evaluating implementation of strategy, action plans and other strategic documents in the field of energy can be achieved within the RS Government, i.e. the responsible ministry which, through an informal established body, would have the following tasks:

- **supervise and monitor the implementation of strategy and action plans,**
- **coordinate measures and activities, i.e. persons responsible for the implementation of specific tasks,**
- **systematically monitor and collect data and information (trend indicator) relating to the implementation,**
- **carry out monitoring of institutions and individuals responsible for implementing the stated goals,**
- **analyze reports of authorities on implementation of strategy and action plans,**
- **evaluate the methods and results of their implementation,**
- **propose measures to increase the effectiveness of implementation of strategy and action plans,**
- **encourage and guide the cooperation of state authorities and other bodies and other entities responsible for implementation of strategy and action plans,**
- **if necessary, prepare reports on the implementation of strategic documents in the field of energy for the general public,**
- **submit annually/three-year reports to the Government of the RS on their work and results of implementation of strategy and action plans.**

## 25. CONCLUSION

Energy Strategy of the Republic of Srpska has been developed in circumstances when it was not possible to sufficiently accurately estimate when the RS will be part of the EU. However, the vision of the energy strategy is set in a way that within the regarded period RS will certainly be part of the EU and that the energy sector should be directed towards the goals set by the EU. In the meantime, requirements arising from the fact that BIH and thus RS is part of the Energy Community of Southeast Europe, which it joined in signing the contract in 2006 should be respected, i.e. commitments based on the principles of effective regulation and liberalization of the energy sector, free competition, secure energy supply security and environmental protection. Actually that means for RS obligatory implementation of the EU legal heritage.

**For the construction of consistent legislation and institutions in BIH, which will allow development of an open energy market, it is necessary to clearly establish the responsibilities of institutions. These responsibilities should be based on constitutional arrangements, the principles of organization of energy markets identified by EU directives, technological constraints arising from energy systems, common principles on which the energy market in BIH is based and efficiency in management and decision making.**

The strategy is to the fullest extent consistent with the requirements of a common EU energy policy and offers a solution for achieving the main objectives related to the safety of supply, competitive and sustainable energy sector development.

**The share of renewables in total energy consumption in the RS at the end of the regarded period is at a level of about 20%. In relation to the so-called gross final energy consumption, for which the goal of EU energy policy is set (20-20-20), the share of renewable sources is much higher. However, only a small part of total energy production from renewable sources will require financial incentives. For this reason, the total amount of funds that should be set aside for the promotion of renewable energy sources will be relatively small, i.e. the collection of these funds will not be significant in terms of burden on those who will participate in filling the fund from which incentives will be paid.**

Security of supply is a prerequisite for economic and social development so that, despite the increase in energy efficiency, energy development and increased consumption of energy are needed. The RS government will take care of security of supply and will monitor market developments in order to assess in time if the security of supply would be endangered. In that case, the RS government will encourage investors to invest in particular activities in the energy sector. On the other hand, the fulfillment of certain objectives of the Strategy can be a significant contribution to the development of industry and the rest of the economy in the RS. The strategy for its realization requires a relatively large investment, which is an opportunity for the economy of the RS to take a good portion of these investments for themselves.

Republic of Srpska can not invest so much by itself, so it is logical and reasonable to expect a substantial investment engagement of foreign investors. Regardless of the fact of global economy halt, there is still strong interest in the energy sector investments.

**For the RS economy, especially in the small and medium entrepreneurship, it will be significant a greater inclusion of renewable energy sources; Primarily for the adoption of new technologies and creation of new jobs.**

**For that has to be taken into account that the experience of countries in the region shows that subsidizing renewable sources does not bring the expected results in terms of reviving the economy and job creation. Investors, who are mostly foreign, almost all equipment, materials and labor and, as far as possible, human resources supply from their countries. Thus, a country in which the investments take place doesn't benefit much. The main benefits take foreign investors and the economy of their countries. So by granting of concessions or authorizations for the construction of certain renewable energy sources, the RS government or local community will condition the minimum share of domestic equipment, materials and labor that foreign investors must take from the territory of the RS.**

If the intended objectives would realize in relation to the application of renewable energy sources, it would significantly reduce the required investment in environmental protection.

In order to encourage investment in the energy sector, given the amount of necessary investments, long-term nature of investment risk and unpredictability of investment outcomes because of the unpredictable movement of world energy prices, the RS government will provide favorable conditions to make such investments attractive.

The favorable conditions in that context are: legal security, efficient state government, macroeconomic stability, an acceptable level of taxes, adequate human resources, built economic infrastructure, protection of market competition, the existence of financial incentives for investment, the existence of specialized state institutions for the promotion of investment, etc.

**One of the most important issues for the energy sector of the RS is building of power plant which would mainly produce electricity for export. Taking into account the economic potentials of the RS, it is clear that the production of electricity (mainly from coal, but also from hydropower) is one of the most important export opportunities. In any case it will depend on the business decisions of potential investors, and from the state of the regional electricity market. These are strategic decisions with long-term consequences, especially when it comes to coal power plants. What is of particular importance for the coal fired thermal power plants is bringing mine in a condition that will ensure regular supply of power plant with sufficient quantities of coal. The RS government is aware of the fact that with the higher thermal power plants construction domestic coal would be already spent in the power plants lifetime. Therefore, the RS Government will before any eventual decision to award the concession to build a new coal power plant take into account all elements of positive and negative impacts of such decisions, so as not to jeopardize the long-term interests of the RS and its citizens.**

With this issue should be analyzed also an indicator of energy dependence. In all scenarios analyzed in the Strategy, the energy dependence of the RS in the future increases (if the energy dependence is observed as the ratio of imported and consumed energy). From the expected level of about 35% in 2010, the energy dependence in the particular scenario is rising to the level of about 42% (S2 and S3) or 45% (scenario S1). Just for comparison, it is expected that the EU as a whole in 2030 will have a level of energy dependence of about 70%. However, what makes the situation in the RS, in this

**sense, better is energy export (mainly of electricity), so the revenue from the export earnings may pay a portion of imported energy.**

**Certainly it should be strived toward as little as possible energy dependence. However, sometimes the opportunities in this regard are very limited. Specifically, in the case of RS, increase in imports of oil and natural gas goes faster than the increase of energy production from domestic resources. And this is the main reason for the increase in energy dependence.**

**To maintain the level of energy dependence in these frames, the RS government will do everything within its jurisdiction, in order to attract investment in domestic energy sources, and will provide conditions for greater inclusion of renewable energy sources and for increase of energy efficiency.**

**Based on this Strategy, the Government of the RS will develop an Action Plan that will be a complementary part of the Strategy. The Action Plan will define the priorities, deadlines, and acting parties of certain activities in order to provide conditions for the realization, i.e. achievement of the objectives of the Strategy.**