

**National background report  
on Energy for Bosnia and Herzegovina**

**Prepared in the frame of the WBC-INCO.NET project by**

Doc.dr.sc. Admir Softić  
Dr.sc. Ljubo Glamočić

**Sarajevo, March 2012**

## Table of Contents

### Executive Summary

### Introduction

#### 1. Purpose of the National Background Report and Methodology/Summary of the Consultation Process

#### 2. The Energy S&T system in Bosnia and Herzegovina

##### 2.1 Bosnia and Herzegovina Energy-policy Framework

###### 2.1.1 The Overall Energy Policy Framework

###### 2.1.2 The Elements of Energy Research and Policy Making

- national strategies that exist or that are being prepared/planned

##### 2.2 Overview of Energy Research Activities

###### 2.2.1 Energy Research Projects

###### 2.2.2 Key Competences in Energy Research Fields

###### 2.2.3 Energy Research Infrastructure

- most important relevant institutions (political, administrative, higher education, public/private research institutions)

##### 2.3 Key Drivers of Energy Research

###### 2.3.1 Main Energy Sector Trends in BiH

###### 2.3.2 Main socio-economic challenges in BiH

#### 3. Integration of BiH into the European Research Area in the Field of Energy

#### 4. SWOT Analysis of the Energy Research Capacity in BiH

##### 4.1 Strengths

##### 4.2 Weaknesses

##### 4.3 Opportunities

##### 4.4 Threats

#### 5. Energy Research Priorities for BiH

##### 5.1 Energy Research Priorities on the Basis of the Country's Readiness\*

###### 5.1.1 Priority 1 (including explanation and if possible further specification for sub-Theme, area, activity...)

###### 5.1.2 Priority 2

##### 5.2 Energy Research Priorities on the Basis of Future Potential\*\*

###### 5.2.1 Priority 1

###### 5.2.2 Priority 2

#### Annex I. Classification of the Energy research fields

---

\* **Definition: *Readiness*:** priorities for which the country has the appropriate human resources and research infrastructures in order to pursue research and development.

\*\* ***Potential*:** priorities that are considered attractive for the country and have future potential

## Summary

Whether it is about energy security, energy efficiency or renewable energy sources, it is clear that the subject of this report will be at the top of the agenda of the EU, its member states, and countries aspiring for membership, including BiH.

As in other areas, energy policy of the EU is a "moving target". Its characteristics are constant changes, difficult and slow harmonization, and significant resistance of national policies that find it hard to deny the myth of "energy sovereignty".

Simultaneously, issues related to energy are getting more widespread in our country. Whether it is about energy efficiency, increased attention that is being given to renewable energy sources or the announced big investments in the overall energy sector and supporting infrastructure, energy is a topic which, after several decades of neglect, once again becomes the focus of economic and political life in BiH.

Three main aspects of European Union energy policy are:

- security of supply;
- competitiveness and
- sustainability.

Security of supply involves cross-border trade and transit of energy, diversification of supply sources and transport routes, appropriate investment signals in the area of infrastructure and energy capacity building and energy storage. Together, they influence the formation of attitudes and policies in the field of energy security.

Competitiveness includes increasing energy efficiency and efficient use of economic instruments, enabling consumers as well as new energy producers to connect to the network, using renewable energy sources, larger share of energy from renewable sources to final energy consumption, cogeneration (combining heat and power), distributed generation and energy use, and appropriate investment signals.

Sustainability involves reducing energy consumption, better use of available technology, more efficient use of energy, diversification of access to local or domestic energy sources and reducing energy imports and sustainability from the standpoint of environmental impact.

Given the complexity of the constitutional order of Bosnia and Herzegovina, and shared responsibility in the field of energy, a comprehensive national energy strategy has not been made, and investment plans have not been agreed upon. Preparation of a comprehensive development strategy for the BiH energy sector has been announced for years and is one of the short-term priorities of the 2008 European Partnership. On the other hand, RS has recently adopted its Energy Strategy, whereas FBiH already has developed a strategic plan, but it has not yet been adopted. In developing these documents there was no coordination between the entities.

Protecting the environment is an important aspect in the energy sector. Although BiH has signed numerous international agreements, these commitments are not enforced adequately. In this area, the European Partnership Agreement requires: the adoption of a state-level law on environmental protection in order to create a harmonized legal framework for environmental protection, further implementation of legislation in this area, ratification and starting the implementation of international conventions, including the Aarhus and Espoo conventions, establishment of a state environmental agency and ensuring its functioning, strengthening of administrative capacity relating to environmental protection and improvement of communication and coordination between these institutions. First National Report of BiH

in accordance with the UNFCCC positively evaluated the functional structure of the existing commitments on climate change in 2009. National Report II is being prepared.

## Introduction

In order to ensure normal life and progress in Bosnia and Herzegovina, regardless of shared responsibilities and the complexity of its administration, among other things, an agreement has been reached on the need for an Energy Sector Development Strategy of Bosnia and Herzegovina.

An energy strategy is a fundamental act in any country for establishment of policies and plans to advance energy. That means to have modeled the current situation and prospects in order to be able to determine the sites, resources, and to predict the structure needs, transformation, transport, and consumption of energy. The strategy ensures the use of energy sources to achieve economic and social benefits in an environmentally acceptable manner. The Energy strategy is along with the Economy strategy. One of the most important ones, which includes aspects of economics, law, organization, institutionalization, and education with a view to providing energy management requirements equal to those in the European Union to link the appropriate energy system (electricity, oil, gas,...) in Bosnia and Herzegovina with the EU, in order to ensure conditions for general and effective inclusion of BiH into the EU.

BiH is the only country in the region with a positive balance of electricity exports, and the eighth country in Europe in terms of hydro power - just over one third (37%) of the hydropower potential is being used. Also, it is estimated that BiH has the greatest potentials for energy production from renewable sources (wind, solar, biomass, and geothermal energy) in the Balkans, and they are 30% higher than the EU average. Moreover, BiH has more than six billion tonnes of coal reserves. After privatization of the Oil Industry in the Republic of Srpska and revitalization of manufacturing plants, supply of petroleum products is mainly done from domestic capacities, while gas is imported from Russia.

The energy sector in BiH is considered its greatest long-term development potential. Bosnia is rich in natural water resources and is the only net exporter of electricity in the Western Balkans. In the year 2009, the main sources of energy in BiH were hydro and thermal power plants that cover 62% of total primary energy consumption<sup>1</sup>. Hydro potential of the country is estimated at 8000 MW<sup>2</sup> with technically feasible potential of 6,800 MW and economically feasible potential of 5,800 MW. The production capacity of currently existing plants is 2,100 MW, of which the Republic of Srpska 720 MW and FBiH 1380, which is 53% of the total energy produced and only 37% of the total economically feasible potential. BiH is in the 8th place in Europe<sup>3</sup> with its annual hydroelectric potential. Significant natural resources in BiH are coal, whose reserves are estimated at something over 6 billion tonnes. Currently, there are four thermal power plants in the country with 1,745 MW of installed capacity – in the Republic of Srpska 600 MW and in FBiH 1145 MW. Bosnia and Herzegovina also has significant potential in renewable energy sources, green energy, such as wind, solar energy, biomass and geothermal energy. Their utilization potential is by 30% higher than the EU average, and the highest in the Balkans (REEEP, 2007). This in particular pertains to wind energy potential, estimated at 600 MW, the solar energy, estimated at 67.2 PWh<sup>4</sup>, and biomass, taking into account the rich forest resources<sup>5</sup>.

The potential to develop a renewable energy sector in BiH does not end on the listed indicators. This sector has the potential to ensure the basis for further development of the country for future generations

---

<sup>1</sup> World Bank (2008): Energy study in BiH, Ministry of Foreign Trade and Economic Relations Sarajevo, Bosnia and Herzegovina

<sup>2</sup> Megawatt

<sup>3</sup> World Bank (2008): Energy study in BiH, Ministry of Foreign Trade and Economic Relations

<sup>4</sup> Petawatt-hour

<sup>5</sup> World Bank (2008): Energy study in BiH, Ministry of Foreign Trade and Economic Relations

through the EU long term development strategy, interest of foreign investors, positive influence on other sectors such as tourism, environmental protection, agricultural improvements and energy efficiency (especially heating in households), employment opportunities, introducing new technologies, innovative new companies and cooperation of the private and public sector.

All natural gas is imported into Bosnia and Herzegovina from Russia. The gas system in Bosnia and Herzegovina includes 191 km of gas pipelines with the capacity of some 1 billion cubic meters. However, the long-term needs for gas in Bosnia and Herzegovina are estimated at 3 billion cubic meters, meaning that there is a big potential for development of distribution and for construction of gas pipelines.

In addition, domestic oil reserves do not exceed the level of supplies needed for 90 days. Analysis of the structure of energy consumption by fuel type shows that coal (black coal and brown coal) accounts for 45.3%, oil 21%, firewood 20.5%, and other energy for 13.1% of total energy consumption. Households are the biggest consumers of energy accounting for 52% of total consumption, industry and transport 20%, while services and agriculture individually consume 6% and 2%. The main source of energy for households is firewood accounting for 57%, electricity 18.7%, and coal 10%. Electricity as an energy source is present in the industry with 42%, oil 22%, coal 16% and natural gas 15%. The transport sector mainly uses diesel fuel 57.8% and gasoline 40.4%. In the service sector electricity accounts for 64% of energy consumption, and in agriculture diesel fuel is most used, accounting for 88%<sup>6</sup>.

## **1. Purpose of the national background report and methodology/summary of the consultation process**

The purpose of this report is to perform expert analysis of the existing situation in the sector, determining needs and opportunities of the energy sector (ES), both individual sub-sectors and the sector as a whole, taking into account the direction and intensity of development of ES in BiH, the region, Europe and worldwide.

## **2. The Energy S&T system in Bosnia and Herzegovina**

Energy consumption is a significant indicator of the living standard. In 2000, the average consumption of energy in the world was about 70 GJ per capita. In developed countries it reached 236 GJ/capita, and in Bosnia and Herzegovina it was about 45 GJ per capita, which clearly indicates that it was significantly below average. Before the war, the level of energy use in Bosnia and Herzegovina (the data refer to the year 1991) was about 73 GJ per capita per year, which exceeded the world average (about 69 GJ / capita). One of the indicators of the efficiency of energy utilization in a country is the energy intensity ratio, which represents the ratio of energy consumed and the GDP. In 2000, on average, 10.14 GJ was consumed to produce 1000\$ of GDP on the world level. In the same year, developing countries used 22.57 GJ for 1000\$, and in BiH 30.1 GJ was consumed for generation of the same level of revenue, while in the Republic of Srpska the energy intensity in 2011 amounted to about 330 kgoe/1000 Euro. Based on these data we can conclude that in BiH, with the existing energy intensity, the energy sector spends more than 20 percent of GDP. Such a high share of the energy sector in the GDP clearly indicates that the energy sector in BiH requires considerably more attention. The basic identified sources of primary energy in BiH are coal and hydro-power. In 2001, annual production of energy from those sources in BiH amounted to about 62 percent of the total consumption of primary energy, which indicates that BiH is dependent on the imports of energy, as certain energy sources, for now, can not be replaced with domestic energy sources. The overall coal reserves in BiH are estimated at 4.539 million tonnes (excluding the reserves in Duvno), of which 1.623 million tonnes are brown coal reserves and 2.916 million tonnes are lignite deposits. Off-balance sheet reserves are estimated at 905 million tonnes (224 million tonnes of brown coal and 678 million tonnes of lignite). The total hydro-power potential is estimated at 22,050 GWh annually, i.e. at 6,126 MW of installed capacity. Preliminary research surveys of oil and gas, which

---

<sup>6</sup> World Bank (2008): Energy study in BiH, Ministry of Foreign Trade and Economic Relations

were interrupted by the war, had indicated the presence of promising deposits on a number of sites in certain areas of BiH. Information about this research is not publicly available (although the off-balance sheet reserves are estimated at about 50 million tonnes of oil, and less than 10 percent of potential deposits has been surveyed) In 2010, concessions to continue the research of oil and gas for a period of three years were granted.

The potential for exploitation of geo-thermal energy, wind energy, solar energy and bio-mass energy have not been sufficiently explored, but the share of these energy sources in the overall consumption will certainly remain modest, as is the case in the world, where it is projected that in 2020 the share of all renewable sources (including hydro-power, which holds the most significant share) will amount to about 7,7 percent. The share of energy from renewable energy sources in relation to final consumption in the Republic of Srpska was about 29.5% for 2011. The goal for 2012 is 36%. However, the increased use of renewable sources of energy in the world is significant and the their potential and feasibility of their use should be analyzed. The bulk of coal (about 70% in 1990, more than 90% in 1997 and about 78% in 2001) is used for power production. Taking into account the economicality of coal exploitation, as well as the existing efficiency of the transformation of coal energy into other forms of energy, a part of coal used in the production of electricity could be reduced in comparison with the existing situation. The present level of consumption of oil and gas is significantly lower than the pre-war consumption. The consumption of oil and gas should rise once the economy revives. Imports of crude oil will be continued over the next year. Its processing will be done in production facilities of the Brod refinery, whose capacities are sufficient to meet the needs of the BiH market. Current gas consumption is significantly lower than in 1990, again due to the poor conditions in the industrial sector. Due to the unfavorable natural gas consumption mix (relatively high share of heating and household consumption), the dynamics of consumption are also unfavorable (winter consumption is considerably higher), resulting in increased prices of natural gas. In addition, gas is procured over only one pipeline and from only one supplier, which makes supply stability an issue.

The problem of storing oil and, possibly, natural gas, has not been resolved, although some solutions for gas storage facilities exist. In the EU countries, the preparations for the increase of oil supplies above the mandatory 90-days supplies are underway. In addition to securing the flow of oil in case of supply disruptions, these supplies would be used in case of unpredicted oil price market fluctuations. The problem of storing oil and petroleum products needs to be addressed urgently. Although the level of meeting basic energy needs is rather high in BiH, the poor still have a significantly more limited access. Most households in BiH are connected to the electric power supply, but that is much less frequent when it comes to natural gas or district heating. The people in lower income categories spend significantly more to satisfy their basic energy needs. In addition, the use of firewood is very widespread in BiH, particularly in poor households.

### **Problems in the sector**

- disharmony and divided authority in the sector between the various levels of government (state, entities, cantons, municipalities)
- underdeveloped legal framework
- technological backwardness,
- administrative pricing of electricity,
- delays in mining sector restructuring,
- irrational energy consumption,
- high transport costs,

### **2.1 Bosnia and Herzegovina Energy-policy framework**

After the breakup of Yugoslavia (1992), Bosnia and Herzegovina has experienced severe economic and political changes. According to the current structure, Bosnia and Herzegovina is decentralized and consists of two entities and one district: the Federation of Bosnia and Herzegovina, the Republic of Srpska and the District of Brcko. The complexity of political and organizational structure extends to the energy sector, where the entities have the primary responsibility over the sector, overseeing and owning three power utility companies, an oil refinery, transportation and distribution of natural gas and coal mines, while heating companies are under the jurisdiction of municipal (the Republic of Srpska) or cantonal (the Federation of BiH) governments.

Responsibilities of MoFTER BiH in the field of energy are:

- defining policy, basic principles, co-ordinating activities and harmonising plans of the Entity authorities and bodies at the international level,
- ensuring implementation of laws and international obligations of Bosnia and Herzegovina, concerning the energy sector,
- policy-making in accordance with the Law on Transmission, Regulator and System Operator of Bosnia and Herzegovina,
- monitoring the work of state institutions in the electricity sector (SERC, ISO BH, Elektroprenos) on the basis of their reports submitted to MoFTER,
- MoFTER cooperates with the entities and institutions to implement a law on ISO and Transmission.

### **2.1.1 The overall Energy policy framework**

The energy sector in BiH is considered its greatest long-term development potential. Bosnia is rich in natural water resources and is the only net exporter of electricity in the Western Balkans. BiH is the eighth country in Europe in terms of hydropower - just over one third (37%) of the hydropower potential is being used. Also, it is estimated that BiH has the greatest potentials for energy production from renewable sources (wind, solar, biomass, and geothermal energy) in the Balkans, and they are about 30% higher than the EU average. Moreover, BiH has more than six billion tonnes of coal reserves, lignite deposits and peat. BiH imports oil and gas, although there is some capacity for oil refining. The main sources of energy in BiH are hydro and thermal power plants that cover 62% of total primary energy consumption. Hydro potential of the country is estimated at 8000 MW with a technically feasible potential of 6,800 MW and economically feasible potential of 5,800 MW. Production capacity of currently existing plants is 2,100 MW, of which in the Republic of Srpska 720 MW and in the Federation of BiH 1380 MW, which is 53% of the total energy produced and only 37% of the total economically feasible potential. With an annual hydroelectric potential of 99.256 GWh, BiH is in the 8th place in Europe. Currently, there are four thermal power plants in the country with 1,745 MW of installed capacity, of which in the Republic of Srpska 600 MW and in the Federation of BiH 1145 MW. Bosnia and Herzegovina also has significant potential in renewable energy sources, green energy, such as wind, solar energy, biomass and geothermal energy. Their utilization potential is by 30% higher than the EU average, and the highest in the Balkans (REEEP, 2007). This in particular pertains to the wind energy potential, solar energy, and biomass, taking into account the rich forest resources. Analysis of the structure of energy consumption by fuel type shows that coal (black coal and brown coal) accounts for 45.3%, oil 21%, firewood 20.5%, and other energy for 13.1% of total energy consumption. Households are the biggest consumers of energy accounting for 52% of total consumption, industry and transport 20%, while services and agriculture individually consume 6% and 2%.

### **2.1.2 The Elements of Energy Research and Policy Making**

- national strategies that exist or that are being prepared/planned

General energy policy framework presented by the "Agreement on the principles of energy policy" and signed on 06.11.2008 by the Prime Ministers of the entities and the Chairman of the Council of Ministers, stipulates that the principles for the development of the state energy strategy be defined once the entities' strategies have been adopted. Pursuant to the Agreement and previously initiated activities, the Parliament of the Federation of BiH (the House of Representatives at the session held on 13.01.2009 and the House of Peoples at the session held on 19.03.2009) adopted the "Strategic Plan and Program of the Energy Sector Development of FBiH". In December 2010, the National Assembly of the Republic of Srpska adopted a draft form of the Republic of Srpska Energy Development Strategy for the time period until 2030 and submitted it for public debate. The strategy was finally adopted by the National Assembly in March 2012.

MoFTER BiH, as the ministry responsible for the fulfillment of international obligations in the energy sector, should start to work on harmonization of the terms of reference for the development of a comprehensive strategy for energy in BiH for the time period until 2030, ensuring that the entity strategies are harmonized and that Bosnia and Herzegovina as a whole can meet the requirements of the Treaty establishing the Energy Community with the aim of integrating the energy market in BiH with the regional energy market and the EU energy market.

As stated by the Federal Ministry of Energy, Mining and Industry, the purpose of making strategic plans and programs to develop the energy sector of the Federation of BiH is to, in the absence of a state strategy for the energy sector, perform expert analysis of the current situation, identify needs and opportunities for the development of the energy sector in FBiH, both individual sub-sectors and the sector as a whole, taking into account the direction and intensity of development of ES in BiH, define conceptual settings and conditions for a radical reform, unblock the stagnation of investment and construction of new energy facilities and achieve the preconditions for sustainable development of the energy sector in both FBiH and BiH as a whole. The document should be the basis for a comprehensive energy strategy at the state level.

As stated by the Ministry of Industry, Energy and Mining of the Republic of Srpska, the Energy Strategy in Republic of Srpska outlines priority directions of the development in the energy sector and security of energy supply for the time period until 2030, by various scenarios, all in accordance with applicable regulations, European legislation and obligations under the Treaty establishing the Energy Community. Development of a strategy in the Republic of Srpska is in line with the Agreement signed on 06.11.2008 by the Prime Ministers of the entities.

## **2.2 Overview of Energy Research Activities**

At the current intensity, energy consumption accounts for 20% of GDP in Bosnia and Herzegovina. According to the assumptions in 2000, household and commercial sectors account for about 50% of the total energy consumption. Bosnia and Herzegovina takes advantage of its fast mountain streams and rivers using hydroelectric power plants to generate electricity. The main sources of energy in BiH are hydro and thermal power plants (using coal) that cover 62% of total primary energy consumption. There is a significant number of opportunities for potential investors, and those opportunities are mostly related to infrastructure projects on the rivers Drina, Neretva, Bosna, Una, Trebisnjica and Vrbas, but also to the development of over 200 small hydropower plants on other rivers. In addition, Bosnia and Herzegovina has great potentials for energy production from renewable sources, such as wind, solar, biomass, and geothermal energy. Furthermore, Bosnia and Herzegovina has considerable reserves of brown coal, lignite and peat, estimated to amount to over 6 billion tonnes. Three major coal deposits are situated in the Tuzla region, the region of Central Bosnia and Gacko basin. There are four thermal power plants in these areas, and they use domestic sources of coal and lignite, and exploit their full capacity. These coal reserves offer a range of opportunities for investors in infrastructure projects such as new



mines and new thermal power plants, and plants to produce liquid fuels from peat. In addition, research shows that in Bosnia and Herzegovina there is a number of promising oil deposits.

Gas system in Bosnia and Herzegovina includes 191 km of main gas pipeline, with an annual capacity of 1 billion m<sup>3</sup>, as well as a developed distribution system, especially in Sarajevo. In relation to long-term needs for gas, the demand may reach between 2 and 3 billion m<sup>3</sup>. Therefore, further development of the gas sector in Bosnia and Herzegovina is inevitable.

In Bosnia and Herzegovina, in the structure of total energy consumption the most used is coal accounting for 45.3%, followed by liquid fuel 21% and timber 20.5%. Other forms of energy (hydro, natural gas and imported electricity) account for 13.1% of total consumption.

Households are the biggest consumers of energy accounting for 52% of total consumption, industry and transport 20%, while services and agriculture individually consume 6% and 2%. The main source of energy for households is firewood accounting for 57%, electricity 18.7%, and coal 10%. Electricity as an energy source is present in the industry with 42%, oil 22%, coal 16% and natural gas 15%. The transport sector mainly uses diesel fuel 57.8% and gasoline 40.4%. In the service sector electricity accounts for 64% of energy consumption, and in agriculture diesel fuel is most used, accounting for 88%.

In Bosnia and Herzegovina there is no production of energy from renewable sources except for small hydropower plants in the Federation of BiH with 23.7 MW of installed capacity and 14 MW of installed capacity in the Republic of Srpska. As for biomass, 1.5 million tonnes of fuel wood can not be considered a renewable source, because there are no data on the sustainability control of this source. For 2010/11 EC in its study of biomass consumption in BiH, estimated that the total consumption of biomass is 330 ktce in the Republic of Srpska and 418 ktce in the Federation of BiH. So far, there is no numerically expressed objective that would show in percentages how the much of total energy needs can be covered from renewable sources.

Data were taken from the Studies of the energy sector in BiH, which was launched in early April 2008. The Study was conducted by a consortium led by the Energy Institute Hrvoje Pozar, and the project was supported by the World Bank. This is the first comprehensive study of development of the energy sector in Bosnia and Herzegovina, and it can be a good basis for strategy making at the national level and the Entity levels, and as a basis for making action and business plans of various energy entities in BiH.

Preliminary GTZ studies indicate that there is an economic potential in BiH for the development of approximately 600 MW of electricity based on wind energy. According to measurements that date back to pre-war period, the region of Trebinje through Mostar to Bugojno reported values are more than promising. The same measurement results have also been confirmed in more recent studies, according to which there is a large region with wind speeds greater than 10 m/hour and height of 10 meters for more than 150 days a year.

- Wind-atlas at the national level does exist, but research in this area remains sporadic.
- No plants are in operation, except for some which are under preparation and construction.

There is interest in building a wind farm in BiH. Several companies filed requests and project documentation for construction of wind farms with 57 wind columns at the location of Gradina in the municipality of Tomislavgrad, and for the concession to build a wind farm with 24 wind columns at the location of Iovik, in Livno. So far, in the Register of the Federation of BiH (FMERI) three facilities have

been registered, two of which are under construction by JPH ZHB (Podvelezje, Mesihovina), and one by the company "KONCING" doo Posusje (Kupres and Rilic).

In the scope of a project, financed by the Spanish Embassy in BiH, wind measurements have been made on 10 micro-sites from Livna to Ravno and it has been found that on the three sites (Livno, Mesihovina, Velika Vljajna) there are good possibilities for commercial production of electricity.

With the solar irradiation of 1.240 kWh/m<sup>2</sup>/year in the north and 1,600 kWh/m<sup>2</sup>/year in the south, the conditions for the use of solar energy in Bosnia Herzegovina are quite favorable.

- Annual average daily solar irradiation varies between 3.4 -4.4 kWh/m<sup>2</sup>.
- Estimated technical potential is 685 PJ, or 6.2 times greater than the total energy demand for primary energy in 2000.

So far, about ten solar power projects under construction have been entered in the Register of the Federation of BiH (FMERI).

### **2.2.1 Energy Research Projects**

- The only comprehensive study of the energy sector in Bosnia and Herzegovina so far is "ESSBiH" which was unveiled in early April 2008. The study was developed by a consortium led by EIHP (Energy Institute Hrvoje Pozar), a project supported by the World Bank. This is the first comprehensive study of development of energy sector of Bosnia and Herzegovina, which served as a good basis for making a number of other documents at the national and entity levels , and can also serve as the basis for the development of action and business plans of various energy entities in BiH .
- "BiH Study on possibility of usage and promotion of solar energy development" financed by the Government of Spain, has identified areas in Bosnia where it is possible to use solar energy. The project included analysis of existing supply of solar thermal and photovoltaic technologies in Bosnia and Herzegovina, analysis of the institutional, regulatory and legal framework and possible financial support instruments.
- Preliminary studies by GTZ indicated that in BiH there is economic potential for the development of approximately 600 MW of electricity based on wind energy.
- Detailed Natural Gas Sector Restructuring Study in BiH was done in 1999 by British consultants (NERA - National Economic Research Associates)
- Energy Development Strategy of the Republic of Srpska until 2030(Producer: Energy Institute "Hrvoje Pozar" Zagreb).
- Study on the assessment of biomass potential and possibilities of producing heat and electricity from biomass in the Republic of Srpska, AER 2009.

### **2.2.2 Key Competences in Energy Research Fields**

Competences from the perspective of potential investors.

With regard to potential investors now there are a number of input points in the energy system of BiH. Approaches can be made at the state level through the Ministry of Foreign Trade and Economic Relations

(MoFTER), then the SERC or ISO operator; and at the entity level, through the governments, line ministries, Commission for concessions, regulators or the EP and at the cantonal level.

The EU Directive requires a transparent process that has been published. We hereby suggest that a simple procedure and criteria for the construction of new power plants should be defined, with full respect for the entities and their competences. This method would simplify procedures for investors.

### **2.2.3 Energy Research Infrastructure**

Most important relevant institutions (political, administrative, higher education, public/private research institutions)

#### **Governmental bodies:**

##### **Bosnia and Herzegovina**

- MoFTER BiH
- SERC BiH
- ISO BiH
- Elektroprenos a.d. Banja Luka

##### **Federation of Bosnia and Herzegovina**

- Ministry of Energy, Mining and Industry of Federation of Bosnia and Herzegovina (FMEMI)
- FERK
- JP Elektroprivreda BiH d.d. Sarajevo
- JP Elektroprivreda HZ HB d.d Mostar

##### **Republika Srpska**

- Ministry of Industry, Energy and Mining of the Republika Srpska (MIEMRS).
- RERS
- Elektroprivreda RS a.d. Trebinje

#### **Scientific and educational institutions:**

- Faculty of Electrical Engineering Sarajevo
- Faculty of Electrical Engineering Tuzla
- Faculty of Electrical Engineering Banja Luka
- Faculty of Electrical Engineering East Sarajevo
- Faculty of Mining, Geology and Civil Engineering Tuzla
- Faculty of Mechanical Engineering Sarajevo
- Faculty of Mechanical Engineering Tuzla
- Faculty of Mechanical Engineering Mostar
- Faculty of Mechanical Engineering Banja Luka
- Faculty of Mechanical Engineering East Sarajevo
- Faculty of Architecture and Civil Engineering Banja Luka
- Faculty of Mechanical Engineering and Computer Engineering Mostar
- Faculty of Technical Engineering Bihac
- Academy of Sciences and Arts of Bosnia and Herzegovina
- Academy of Sciences and Arts of the Republic of Srpska

#### **Non-governmental bodies:**

- CETEOR, Sarajevo
- Municipal Engineers Association Banovici
- **Independent scientific and research bodies (economic entities):**
  - Energoinvest d.d. Sarajevo
  - Research and Development Center of Gas Technology, "IGT" doo Sarajevo
  - "Rudarski institut" d.d Tuzla
  - Institute of protection, ecology and informatics, Banja Luka
  - Economic Institute, Banja Luka
  - Institute "IG", Banja Luka

## **2.3.Key Drivers of Energy Research**

### **Key drivers:**

- Competent institutions (the Council of Ministers, MoFTER BiH, Entity Governments).
- Political Community in BiH (orientation towards Euro-Atlantic integration).
- The European Union, the Energy Community.
- Potential investors in the electric power system of BiH.

### **2.3.1 Main Energy Sector Trends in BiH**

Different approaches in the energy sector of Bosnia and Herzegovina on the one hand and the international obligations of BiH in the process of integration and fulfillment of obligations on the other produce a long delay in objectively possible faster development and the use of international financial resources and projects. The neighboring, and other countries from the former Yugoslavia, achieve faster progress in energy sector reforms, because they are not burdened with internal structural and other problems like Bosnia. The illustration of the above-mentioned state:

BiH at this moment on the state level does not have the following:

- Energy Development and Efficiency Strategy (ESSBiH-the World Bank Power III has not been formally revised; work on the strategy (EC grant) suspended - poor organization and coordination);
- Law on Energy and Energy Efficiency (as provided for by the signed and ratified Energy Charter - ECT, and other documents);
- Directorate / Institute / Agency / Center for Energy and / or energy efficiency;
- energy balance at the state level (energy requirements and consumption, projection, etc.).

Most activities in the sphere of energy take place at the entity level.

Reforming the energy sector in Bosnia and Herzegovina, in fact, contains two parallel processes:

- General energy reforms aimed at achieving international standards, as in all other candidate countries, new and old member states.
- The reconstruction, reintegration, modernization and construction of new facilities in the energy sector due to increasing energy demand and the obsolescence of existing facilities.

To get closer to the fulfillment of obligations under the Treaty establishing the Energy Community, it is necessary that MoFTER BiH together with the competent entity ministries find solutions to meet the obligations of the Agreement and other binding international treaties.

### **2.3.2 Main socio-economic challenges in BiH**

The Council of Ministers, at the 117<sup>th</sup> session held on 25.03.2010, adopted a Social Action Plan for Bosnia and Herzegovina in connection with the Memorandum of Understanding on social issues in the context of the Energy Community (Official Gazette of Bosnia and Herzegovina No. 35/10, 3.5.2010)

The objective of the Action Plan is to identify harmonized, consistent, focused and implementable actions, measures and recommendations for the protection of vulnerable categories of consumers of energy, take care of the employees who face potential redundancy and improve working conditions and safety at work in the energy sector, and improvement of social partnership.

Social Action Plan for Bosnia and Herzegovina aims at, based on the specific characteristics of Bosnia and Herzegovina in the context of energy sector reform, activities and recommendations in the following areas:

1. Protection of socially vulnerable energy consumers;
2. Addressing the results of the reforms in the energy sector related to the work force;
3. Recommendations for improvement of social partnership;
4. Improving working conditions, occupational and health safety of employees in the energy sector;

### **3. Integration of BiH into the European Research Area in the Field of Energy**

Bosnia and Herzegovina has signed a series of treaties from which obligations arise related to policy and regulatory reforms in the energy sector. As a signatory to these agreements, BiH has taken a series of obligations.

Current progress in reforming regulations and the application of the agreement include:

- adoption of laws and regulations on electricity;
- Establishment of new institutions in the electric power sector, at the state level: SERC, ISO and Transco, and at the entity levels FERK and REERS;
- establishment of a functional accounting system and ensuring distribution protection and electricity supply in the RS, reforms are ongoing in the FBiH;
- as from 1.1.2008, all users of electricity except households can individually buy electricity;
- distribution networks damaged during the war were re-connected with networks in Western Europe;
- ministers (state and entity levels) have reached an agreement on regulating the sector (RS adopted the Law on Gas, and the Federation a Decree with legal force).
- based on the commitments accepted by signing the agreements, the outstanding obligations BiH has yet to fulfill have been defined;
- commission for the Preparation of Legal Documents has been established at the state level in 2007, but so far it has not yielded any results;
- most of the obligations arising from the Energy Community of South East Europe (ECSEE) have not been fulfilled, despite the terms and obligations related to the Stabilization and Association Agreement, including the Road Map;
- no detailed database on the use and consumption of energy;
- electricity tariffs are not liberalized nor is there any contingency plan for the socially vulnerable categories of the population after the cessation of subsidies;
- legislation on energy efficiency has not been modernized

- a strategy for implementation of investments in the gas and electricity sub-sectors has not been created
- the gas sub-sector lacks a legal basis concerning the protection of consumers and suppliers;
- gas pipeline networks are undeveloped and can not meet long term needs.

In addition to working to fulfill these obligations, activities included work on defining the framework for development of energy sector policies. RS has recently adopted an Energy Strategy, while the Federation of BiH has completed a strategic plan and program. Energy sector study in BiH, funded by the World Bank project Power III, is finished and gives an overview of the energy sector in BiH, based on available data.

Completion of a national strategy for the sector was agreed upon between the Prime Ministers of the entities, but there are still some open institutional and operational issues:

- defining the role of the Ministry of Foreign Trade and Economic Relations in the process of implementation and monitoring;
- collecting and harmonizing existing strategies / documents;
- operation of the Transmission Company;
- relationship between ISO and Transmission;
- adoption of a BiH Law on Gas that would define the organizational structure and ways of functioning of the gas sector;
- defining priority investments, and
- defining long-term priorities.

### ***Energy Community Treaty (ECT)***

BiH has signed and ratified the treaty establishing the Energy Community of Southeast Europe in 2005. There is a common regulatory framework for energy markets between the EU and the countries of Southeastern Europe, covering aspects of energy, environment, competition, and consumer protection in relation to electricity, petroleum products and natural gas subsectors.

ECT is a legally binding document for all parties. The contract presupposes the establishment of a legal framework that would enhance and promote long-term cooperation in the energy sector, based on complementarities and mutual benefits in accordance with the European Charter. The establishment of a stable, comprehensive and non-discriminatory regulatory framework for cross-border cooperation in the energy sector, ECT reduces political risks related to economic activities in transition countries.

In this way, economic relations are built between countries with different cultural, economic and legal characteristics, but with common goals, such as:

- provision of open energy markets, ensuring a diversified energy reserves;
- stimulating cross-border investment and trade in the energy sector;
- providing assistance to countries in transition in developing energy strategies, relevant institutional and legal frameworks for energy and the improvement and modernization of domestic industry;
- attracting foreign investment, aimed at promoting energy production in a sustainable manner, and the development of diversified sources of energy imports.

The basic elements of ECT are:

- investment protection (ensuring non-discriminatory treatment of investors, compensation for expropriation, free transfer of capital);
- energy Trading based on WTO rules;

- free energy transit;
- international arbitration in the event of a dispute between the parties;
- improving regulatory transparency.

In addition, ECT assumes cooperation between governments on the issues of technology transfer, opening of financial markets and improvement of competitive environment. The ratification of the ECT is the first step towards the creation of favorable conditions investment in the energy sector. According to the latest report by the European Commission, BiH has not properly implemented EU legislation in the field of energy as required by ECT. In particular, BiH has not reformed the gas sector, and there is a delay in reforming the electricity sector. In addition, the proper functioning of Elektroprenos BiH is largely prevented due to mismanagement and political interference.

The protocol on energy efficiency and related environmental problems (PEEREA) requires signatories to provide economically efficient manner of minimizing negative environmental impacts in their energy projects. Through PEEREA, the principles of sustainable development and profitability of projects are being promoted through:

- defining the principles of policy to promote energy efficiency;
- providing a framework for the development of cooperation and coordination;
- providing guidelines for the development of energy efficiency programs;
- identification of potential areas of cooperation.

ECT in particular states that the Parties shall:

- formulate policy objectives and strategies;
- implement policies
- develop, implement and update programmes
- create the necessary legal, regulatory and institutional environment, and
- cooperate on an international level.

The last report on the implementation of PEEREA in BiH identified problems in the absence of an overall energy policy at the state and entity levels, financing energy efficiency policies and outdated legal framework. ECT also requires the submission of a combined Report on Investment Climate and Market Structure (ICMS), which describes the general investment climate in the sector. BiH has filed this report in early 2010 and it will be posted on the ECT website by the end of 2010.

### ***Stabilisation and Association Agreement (SAA)***

The Stabilisation and Association defines cooperation in the energy sector on the basis of establishing ECSEE which has the following frame work for the implementation schedule:

- during the period of twelve months (starting from July 1, 2007), to implement two directives on the energy market in the EU and the regulation on cross-border network access;
- liberalization of markets for all customers except for households (from January 1, 2008);
- reduction of sulfur content in certain liquid fuels (before December 31, 2011);
- liberalization of markets for all users (rom January 1, 2015);
- limitation of emissions of certain pollutants into the air from large combustion plants (before December 31, 2017).

### ***European Union (EU) or *acquis communautaire* of the EU***

Meeting the EU standards and requirements, including the Technical Assistance Information Exchange (TAIEX) of the European Commission, is of crucial importance for BiH. These policies must be effective

no later than 2030. Indicative Development Plan for the production must be made annually for the period of 10 years. In order for Bosnia and Herzegovina and the entities to successfully adopt EU standards and acquis communautaire it is necessary to:

- adopt policies and develop institutions without overlapping;
- develop, adopt and implement a comprehensive national energy strategy and the necessary legislation;
- implement action plans at the entity level for the restructuring of the energy sector;
- proceed with the execution of plans to limit the privatization of electricity sector that are approved by both governments;
- develop a sustainable and transparent authorization plan to develop new projects approved by both entities;
- organize Distribution System Operator
- start addressing regulatory issues related to renewable energy;
- provide a consolidated system of regulating energy and gas, in accordance with ECT;
- ensure that issues relating to socially vulnerable customers are properly treated;
- start using remote meter reading for electricity as soon as possible, which is necessary for full implementation of market rules for the purpose of fully achieving the functions of market balance.

#### **4. SWOT Analysis of the Energy Research Capacity in BiH**

##### **4.1 Strengths**

- Large hydropower potential,
- significant reserves of coal,
- significant potential for renewable energy sources (wind, solar energy, biomass, geothermal energy),
- positive impact on other economic sectors,
- development of small enterprises in the field of energy.

##### **4.2 Weaknesses**

- energy strategies have been developed at the entity level, but not at the state level,
- poor communication between state and entity institutions,
- obsolete legislation on energy,
- lack of independent expert analyses,
- lack of clear ownership of energy projects,
- lack of a comprehensive database.

##### **4.3 Opportunities**

- interest of foreign investors,
- positive impact on agriculture, tourism, employment, introduction of new technologies,
- entry into the EU,
- modernization, promotion of clean and efficient technologies in the coal sector,
- use of renewable energy sources.

##### **4.4 Threats**

- lack of effective coordination in the energy sector in BiH
- shared responsibility in the field of energy between different levels of government
- hard and slow harmonization towards European integration,



- inefficient use of economic instruments,
- poor use of available technology,
- inadequate enforcement of international agreements.

## **5. Energy Research Priorities for BiH**

Duties and activities of BiH in the process of accession to the EU:

- fulfillment of international obligations in the field of energy
- concept of development and organizational aspects of ES BiH,
- development of harmonized legislation and regulations, activities, carriers, deadlines;
- assessment of investments,
- basic technical-economic indicators of investment, including aspects of energy efficiency, environmental aspects and the life span of a facility.

### **5.1 Energy Research Priorities on the Basis of the Country's Readiness**

Due to lack of capacity in MoFTER, analyzing commitments of Bosnia and Herzegovina, as defined by the European Partnership, the Treaty establishing the Energy Community (a set of Directives and Regulations in the field of electricity, natural gas, liquid petroleum fuels, renewable energy, energy efficiency, and environmental protection), the Stabilisation and Association Agreement, EU Report 2010, and bearing in mind the provisions of Article 9 of the Law on Ministries and Other Administrative Bodies of Bosnia and Herzegovina ("Official Gazette of BiH", No. 5/03), and taking the volume of existing tasks and tasks that lie ahead in the future, it is necessary to strengthen human resources and organizational structure in accordance with existing statutory powers of MoFTER BiH.

The reason for strengthening human resources and organizational structure within the Ministry of Foreign Trade and Economic Relations is that the current organization and capacity of the Department of Primary Energy and Policy and the Department of Secondary Energy and Projects has not been able to adequately respond to the tasks and challenges, within the statutory jurisdiction, in the process of European integration and the to domestic institutions.

#### **5.1.1 Priority 1 (including explanation and if possible give further specification for sub-Theme, area and activities)**

**Establishment of a functional legal framework in the field of energy on the state and entity levels in accordance with the EU acquis - fulfilling obligations under the Treaty establishing the Energy Community.**

- **Energy Sector Development Strategy of Bosnia and Herzegovina –**

MoFTER BiH, as the ministry responsible for the fulfillment of international obligations of BiH in the energy sector, should work on agreeing the terms of reference for the development of a comprehensive Energy Development Strategy of BiH for the period up to 2030, taking into account that the entity strategies are harmonized and that Bosnia and Herzegovina as a whole can respond to the requirements of the Treaty establishing the Energy Community with the aim of integrating the energy market of BiH with regional energy markets and the EU energy market.

Fulfilling the obligations of the EU Directive concerning the safety of electricity supply, which is on the basis of the Treaty establishing the Energy Community binding on BiH with the implementation deadline set for 31.12.2009, is Directive 89/2005/EC concerning measures to safeguard security of electricity supply and infrastructure investment. The Directive establishes measures for the protection of an adequate level of security of supply of electricity and encourages investment in generation, transmission,

distribution and cross-border interconnection. Security of supply in the field of natural gas must meet the provisions of Directive 55/2003/EC and Directive 67/2004/EC.

All of this would be solved by developing an Energy Sector Development Strategy of Bosnia and Herzegovina

- **Law on Gas**

Bosnia and Herzegovina still does not have a legal and regulatory framework at the state level regulating the natural gas sector in accordance with EU Directive 55/2003/EC (internal gas market rules), Directive 67/2004/EC (measures for security of gas supply) and Regulation 1775/2005 (network access requirements).

Partial Transposition of 55/2003/EC has been done through the Law on Gas of the Republic of Srpska and the Regulation on Organization and Regulation of the gas sector of the Federation of BiH.

As far as is known, the reasons for the lack of a Law on Gas at the state level are political in nature, for which there has been no progress and expected convergence of attitudes in Expert team for the development, coordination and harmonization of legislation in the natural gas sector in Bosnia and Herzegovina, on the organization of a gas transportation management system and regulatory functions in the field of gas in BiH. No progress has been made even after the activities the Expert Team agreed upon at the meeting of the Energy Community Secretariat held on 17.2.2010 between the Energy Community Secretariat, the European Commission and the delegation of Bosnia and Herzegovina. In previous meetings, the team determined the position of the state and the entities in this area and a report was submitted to the Energy Community Secretariat. However, the entities approached different to regulating a natural gas market and establishing legal and institutional framework, taking relevant provisions of the directive. Now, MoFTER BiH has a pending task to try to reconcile these positions of the entities and to reach an agreed text of the Law on Gas.

- **Law on compulsory stocks of oil**

This law would ensure conditions for the establishment and maintenance of compulsory stocks of oil. Bearing in mind the current and planned activities, and based on decisions adopted and planned within the framework of the Energy Community, the law should transpose Directive 2009/119 on imposing obligations on Member States to maintain minimum stocks of crude oil / petroleum products. By the adoption of this legislation and establishment of minimum security stocks of oil, the energy supply to consumers in BiH would drastically increase. Reports of the European Commission on BiH Progress clearly and explicitly recognize the need to address the issue of establishing compulsory stocks of oil.

## **5.1.2 Priority 2**

### **CDM mechanism**

CDM is a mechanism whose base consists of projects aimed at reduction or sequestration of greenhouse gases in developing countries, while achieving the goals of sustainable development and attracting foreign investment. The projects mainly cover the following areas: industrial production, energy efficiency, renewable energy, waste management, forestry, agriculture and transport.

Decision of the Council of Ministers on the establishment of a team to implement projects of clean development mechanism of the Kyoto Protocol of the United Nations Framework Convention on Climate Change in Bosnia and Herzegovina was published in the Official Gazette of BiH No. 102 on 13.12.2010. This decision established the Authority (DNA) to carry out activities which fall within the responsibilities defined by Clean Development Mechanism (CDM) of the Kyoto Protocol to the UN Framework Convention on Climate Change in Bosnia and Herzegovina.

### 5.1.3 Priority 3.

- **Attracting investment to Bosnia and Herzegovina**

Economic relationship with capital in the energy sector determines, on one side the possibility of reconstructing the existing power plants and facilities and building new ones and on the other side promotes interest in investing in energy-related activities. For stable functioning of the energy sector it is therefore important to establish and maintain financial stability and successful performance of energy activities, through internal and external sources of funding, so that project financing is structured in a way that would ensure the validity and viability of the market.

The quality of each source of investment financing is determined by:

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

On the relation between these two elements – the availability of capital and the cost of capital used in financing energy sector development - emerge all positive and negative effects that used capital may have in liquidity, security, stability and profitability of individual companies in the energy sector.

The ways to achieve financial stability and successful performance of energy activities, and to realize the set objectives at the same time, are:

- providing funds for Energy Sector Development,
- rationality in construction and exploitation
- stimulating choice of optimal place, time, intensity and mode of energy consumption.

An obvious conclusion is that, in order to be able to finance the necessary investments in the energy sector, it will be necessary:

- for potential domestic investors to reach positive cash flow in their business, because only cash income can be the basis for investment decisions, or
- for foreign investors to realize greater direct investment.

## 5.2 Energy Research Priorities on the Basis of Future Potential

### 5.2.1 Priority 1

#### Energy Efficiency

No statistics exist and therefore no adequate analysis that would show exactly the potential of BiH for energy cost savings in the public and private sectors. Some studies estimate that it is possible to achieve an overall savings up to 30%. There is no doubt that the potential for savings is large, and we can use data from other countries as an illustration. For example, energy efficiency programs in Bulgaria showed that the potential savings in public schools is 40%, in Serbia 44%. This large potential savings means a rapid return on investment. There is no reason to believe that this potential is significantly different in BiH. In fact, there are no measures in the economy that are more profitable for BiH at this point than measures of investment in energy efficiency (EE) in the public sector. The main EU directive related to energy efficiency in the public sector is The Energy Services Directive (2006/32/EG).

By analyzing the measures taken in other countries in order to meet this Directive, we see that they are usually referring to:

- creating an action plan for energy efficiency in the public sector;

- applications of energy management schemes in the public sector at local levels of government;
- modification of the regulations related to public procurement in the areas related to energy efficiency and the strengthening of legislation;
- establishment of the Agency for EE in order to implement an Action Plan for EE;
- devising a scheme for financing EE projects through the public sector;
- creating a binding database and reporting mechanisms, as well as and databases in the public sector for comparison, monitoring and reporting.

The key is therefore to create action plans for EE, which BiH is still lagging behind with, and a database on energy use in both entities and according to the Eurostat / IEA / UNECE standards, including information on supply and demand for energy. Other measures that would particularly help poor segments of population when electricity prices increase are related to increasing the efficiency of using energy. Some measures could include:

- facilitate the residents of certain buildings to make decisions about renovations (the existing regulation requires the approval of 75% of households; reduce this percentage to 50%), or establish a targeted subsidy for households with lower incomes;
- make energy efficiency a priority for private houses and public buildings, if there is still some money left in the budget for reconstruction;
- it is necessary to restructure the district heating system and reduce enormous distribution costs of thermal energy. Preference should be given to projects that are based on the combined production of heat and electricity;
- establish a program for home renovations for the most affected with better insulation, according to the model applied in the Czech Republic and Romania. This program should be financed from funds that are used for power stations or fuel subsidies (direct fuel subsidies) during winter. In any case, assistance should be redirected towards consumers of energy (by reducing the space to be heated or total heat balance per capita), for example through the replacement of old boilers in power stations. Greater energy efficiency reduces the cost of heating of the population, which means that the investment in less efficient water heater measures. To establish a program of the most vulnerable house renovations with better insulation, according to the model applied in the Czech Republic and Romania. This program should be financed from funds that are used for power stations or fuel subsidies (direct fuel subsidies) during the winter. In any case, aid should be redirected towards consumers of energy (by reducing the space to be heated or total heat balance per capita), for example through the replacement of old boilers in power stations. Greater energy efficiency reduces the cost of heating, which means that investing in a smaller boiler is an effective measure.

### **5.2.2 Priority 2**

#### **Structural reforms**

The case of the Directive on Large Combustion Plants 2017 illustrates the importance of structural reforms, but also how much policy makers are ready to fulfill obligations under the ECT. According to this Directive, as well as economic indicators, investments in lignite mining projects do not make any sense. This becomes a big problem for Bosnia and Herzegovina, because most of the coal used in power plants comes from lignite mines, for example the Coal Mine "Kreka" Ltd. Tuzla, which produces about 2.5 million tonnes of coal for thermal power station in Tuzla. Large investments under nontransparent circumstances create great dependency between energy companies on the one hand, and private investors on the other. Such projects not only call into question the fulfillment of obligations under the ECT, but in the long run, the damage is transferred onto consumers who will eventually have to pay higher prices for energy. The basic structural reforms relates to the reform of managing public goods, and that means breaking the link between government and energy companies, and establishing systems according to EU

standards. This measure alone can create conditions for the creation of relevant policies and improve management which at the bottom line is for the benefit of the citizens.

### **5.2.3 Priority 3**

#### **Renewable Sources of Energy**

Investing projects in renewable energy sources in BH, as has been said, are still insignificant and effective support policies and programs that might come up will be clear only when we are able to better evaluate the pilot projects being implemented by institutions such as the EBRD, IFC and UNDP. For now we have no practical examples in order to identify practical / technical barriers. What is evident and what the focus should be on is:

- the implementation of the Regulation on the Use of Renewable Energy and Cogeneration, which has been adopted in FBiH; in RS, the implementation process of this Regulation began on 01.01.2012;
- increase the feed-in tariffs in order to become competitive in comparison to other markets in region;
- create action plans and capability analyses of converting large combustion plants into biomass plants, and capability analyses of creating action plans for support to farmers – for purchase of agricultural waste for the purpose of selling it to biomass production plants;
- use best practices of the small plants for biomass evaluating projects implemented by the UNDP pilot projects and the investment required to achieve economies of scale;
- In plants that produce large amounts of thermal energy and thermal power plants, strategically evaluate the possibility of production and distribution of combined heat and power.

### **5.2.4. Priority 4**

#### **Modernization of the Coal Sector**

On the basis of the energy reserves in BiH, coal accounts for 93% of the total energy potential of BiH. Exploited for now are only lignite and brown coals. In Tuzla basin (Kreka, Banovici and Djurdjevik), Middle-Bosnian basin (Kakanj, Zenica, Breza), Ugljevik and Gacko basins more than 80 percent of coal in BiH is produced; based on them, strong thermal systems have been built. Analyses show that for the next fifteen-year period (and probably longer) coal has certain energy market prospects in BiH. The achieved level of about 40 percent of pre-war coal production meets the current needs of all consumers. For now there is no demand for a substantial increase in coal production, but its current level must be maintained, and the program of mine modernization and rationalization implemented. Particular attention should be paid to the social consequences of this process, since it is estimated that half the existing number of employees are redundant. Different study creators give different projections of possible needs for coal in BiH by 2015. These forecasts span from 5 to 8.6 million tonnes for FBiH and from 4.2 to 6.2 million tonnes for RS, that is, 9.2 to 14.8 million tonnes for BiH. The production structure consists of 70 percent of needs for electricity generation, and the rest for industry and households. In BiH, there are two types of coal mines:

- mines supplying coal for thermal power plants,
- mines working for the general market (market competition).

In 1990, regional coal mines in the Federation of BiH produced 12 million tonnes of coal. 27.000 people worked in these mines. Two-thirds of the coal production came from surface mines, and one third from underground mines. Mines that are now in the territory of RS produced about 4 million tonnes of coal, with approximately 3000 employees. Surface mining accounted for 95 percent of total production. As of now, in the Federation of BiH 5.5 million tonnes of coal is produced annually, and in RS about 5 million tonnes. The mines in FBiH employ approximately 14 000 workers, while in RS about 2,000. The coal sector is organized into 15 different organizational units, many of which govern over several individual mines. There are no forms of either horizontal or vertical integration between the mines, nor is there any

shared infrastructure, market or any other links. Coal sales in the Federation of BiH are based on decisions by the electric power sector, at the price of KM 4.0 per GJ (price valid for the past 4 years). The mines in the RS are parts of a single company, together with the thermal power plants, and the price of coal is included in the price of electricity, as the expense determined in the energy balance for each year (approximate calculation price is KM 4.5 per GJ). Thermal power plants use the coal from the mines settled in their vicinity. The thermal power plants Kakanj and Tuzla are supplied by railway, trucks and transporters from several mines, and the thermal plants Gacko and Ugljevik are supplied by continuous conveyor, so that, besides economic links, there are also physical links between the mines and the thermal power plants. Mines Ugljevik and Gacko are in the same company with power plants. In all other mines, the production plan is based on the coal demand of the traditional long-term consumers, with individual market offer and creation of competition in the market.

### **Legal and institutional framework**

The starting point for the analysis of the prospects of the coal sector in BiH is in the following international and internal documents:

- FBiH Law on Mining
- RS Law on Mining
- BiH Law on Concessions
- RS Law on Concessions
- BiH Law on Geological Research
- Law on Privatization of State Equity
- RS Law on Bankruptcy
- F/S Marston&Marston USA, for Central Bosnia and Tuzla basin mines
- F/S DMT – Montan Consulting GmbH Germany, for the FBiH mines
- F/S Fichter Germany, for the Bosnia and Herzegovina's electricity sector
- F/S Kennedy&Donkin Ltd. USA, for the mine and smelter in Gacko
- F/S JCI Japan, for the lignite mine in Stanari and the mine and smelter in Ugljevik
- Japanese Government YEN Credit Agreement for BiH mines
- Other agreements on loans and grants

In both entities, the competences for the mines lie with the line ministries – the FBiH Ministry of Energy, Mining and Industry, and RS Ministry of Economy, Energy and Development.

### **Priorities**

The solutions for strategic issues in the coal sector should start with the integral approach to coal basins and coal beds and proceed to selection of specific adequate technological processes, taking into account the following elements:

- demand outlook for energy from coal for the period up to 2015,
- status and potential total balance and exploitation reserves and possibilities for introduction of new technologies (subsurface gasification, IGCC coal gasification technology and refined processing).

The coal sector reform is indispensable for implementation of the strategic goals:

- lowering coal production costs, increase productivity, reduce employment, improve working conditions, raise the living standard of employees and protect environment,
- restructure coal mines, which require a differentiation between the profitable and unprofitable mines, as part of the privatization preparations,
- introduce new production technologies which will improve profitability and ensure better protection

In the adopted documents, the costs of capital increases of the mines in FBiH are estimated at KM 188 million, and KM 122 million for the mines in RS. Closing of unprofitable mines will require additional funds, which in the studies to date was not estimated, nor were the sources identified. The primary conclusion of the restructuring analyses is that over the next five years, the workforce in the mines must be cut from around 14,600 to some 3,500, to enable the coalmines to deliver coal at the price of KM 4 per GJ. It is estimated that alleviation of the unemployment problem would require KM 86 million.

#### **5.2.5. Priority 5.**

##### **Natural Gas Sector progress**

Of the primary energy sources, natural gas is undoubtedly the most desirable fuel, because of its environmental and technological advantages. Even under the assumption that the most favorable price level is reached, which is not the case at present, the fact that the gas is imported fuel is crucial for this analysis and in the planning of the energy sector development from the aspect of poverty reduction. This fuel, notwithstanding its considerable advantages, presents a major challenge for the national policy makers, from the standpoint of protection of the domestic economy. On the other hand, the conditions are in place for wider use of natural gas, as the present level of use is below one-quarter of the capacity of the existing gas pipelines, and this would offer a clean alternate fuel for the needs of the population. From the aspect of the economic development, and primarily development of small and medium industrial and agricultural businesses, the gas is the best energy choice. Therefore, the development of the gas sector in BiH is unquestionable in terms of strategy, but the issue remains about the pace of the gas sector development and whether the sector would be developed in a planned manner, i.e. in conformity with the national interests and strategic goals. The options of substituting the imported natural gas with the gas produced by coal gasification have been under consideration for a long time. Even though this technology had been rejected in all previous expert analyses, based on low utilization ratios, the most recent technological innovations, as well as positive experiences of other countries, give cause for a more serious consideration of this option. It is estimated that, with application of modern gasification processes, one million tonnes of coal, which is a realistic increase for the mining sector, could fully substitute the present imports of natural gas. The development of the gas sector will still mostly depend on the developments in the region. Specifically, the planned construction of the "South European Gas Ring" will determine the future of both the gas sector and the entire energy sector in BiH. All natural gas is imported from the Russian Federation and is transported to BiH via the gas transport systems in Ukraine, Hungary and Serbia. Due to the post-war dissolution of the energy system, BiH is facing an absurd situation – in the entire gas transport (over 5000 km) from the gas wells in Siberia to Sarajevo (which is the main consumer in BiH) the intermediaries involved in the internal transport of gas in BiH outnumber the transport intermediaries up to the BiH border. The main features of the gas system in BiH are: length of 191 km and the projected annual capacities of 1 billion m<sup>3</sup>. The existing leased transport capacities to BiH are 750 million m<sup>3</sup> per year. In the post war years, the consumption ranged from 150-200 million m<sup>3</sup>, mostly because of the failure of the war-ravaged industry to recover. The pre-war consumption in BiH was approximately 610 million m<sup>3</sup> and was on the rise. With respect to the long-term projected gas needs, previous studies analysed three different scenarios (high, low and basic) by comparing economic indicators with other countries and conducting separate analysis across all consumption sectors. The demand projections for all three scenarios are similar for both methods, and amount to 3 billion m<sup>3</sup> for the high scenario, 2 billion m<sup>3</sup> for the basic scenario and around 1.5 billion m<sup>3</sup> for the low scenario, until 2020. In the case of low growth scenario, the energy policy would be based on the use of national energy sources, with partial use of gas where the domestic energy sources are thought non-competitive or technologically inappropriate. From the aspect of this study, this is what makes this particular scenario realistic and conceptually acceptable.

##### **Legal and institutional framework**

The legal and institutional framework in this sector is still non-existent, which prevents any foreign investment and any development of gas sector. Just like the entire energy complex in the post-war BiH, the gas sector is also in the competence of the entities and this structure is at the root of all problems in the sector. It could be said that, out of the three predominant segments of the energy sector (electric power, liquid fuels and gas), the gas sector is the least developed. The existing gas sector of BiH comprises four companies, two in each entity:

In RS:

- Gaspromet Pale (manages the transmission line Karakaj - Zvornik - approximately 20 km)
- Sarajevogas Lukavica (transmission line Zvornik - Kladanj and distribution in the municipality of Srpsko Sarajevo)

In FBiH:

- BH Gas - Sarajevo (transmission lines Kladanj - Sarajevo - Zenica, the biggest post-conflict supplier and gas wholesaler in Bosnia and Herzegovina)
- Sarajevogas - Sarajevo (gas distribution in Sarajevo)

Although it no longer formally conducts the transport and distribution of gas, the Energoinvest Sarajevo needs to be added to the above list of entities (until the outbreak of the war, Energoinvest Sarajevo managed the entire gas system in BiH and was the exclusive gas supplier for the territory of BiH). Because of outstanding debts from the period before and during the war, and the obligations under long-term contracts with Russian suppliers, this company continues to be a major player on the complicated BiH gas market. More than two years ago, after the preparation of studies on the reform and development of the BiH gas sector, the World Bank offered to both entity governments a draft Statement of BiH Gas Policy, which was supposed to serve as the fundamental, common concept of the reform of the gas sector, and, at the same time, the foundation for development of the legislation in the gas sector, following the model previously applied in the electric power sector.

## **Priorities**

The gas sector needs to be set up in harmony with the national energy resources, which would minimize the transport and distribution costs and achieve the best price of gas for the end consumer. Instead of having a well-elaborated strategy of the gas sector development, which would rank BiH as an equal among European natural gas consumers, BiH consumers buy the most expensive gas in Europe, and have completely unreliable supply. Regardless of which scenario for its development comes true, the gas sector must undergo a process of reform and restructuring.

Key reform steps in the gas sector should be consistent with the implementation of the EU Gas Directive and liberalization of markets, which is a prerequisite for integration into the European market. In this context it is necessary to:

### **Transform legislative and institutional framework**

- adopt the Gas Sector Development Strategy within the future BiH Strategy of Energy Sector Development,
- adopt appropriate legislation and regulations, establish an independent system operator, and consider possibilities to resolve the regulatory functions in one of the acceptable ways,
- create an internal gas market,
- introduce a tariff system.

Energoinvest Sarajevo and BH Gas import natural gas to BiH from Gazprom Company from Russia, via Ukraine, Hungary and Serbia.



### **Strengthen capacities and improve efficiency of the gas sector**

- build an alternative supply route to diversify supply sources,
- build underground storages and improve the load factors in the existing gas system,
- expand the gas distribution network to include several cities to which gas can be cost effectively supplied through the extensions of the existing system,
- make preparations for attracting strategic partners (prepare the privatization documentation).

Ultimately, this means implementation of the EU Gas Directive and liberalization of the market, which is a precondition for integration into the European market.

### **Actively represent BiH interests on the international scene**

- protect BiH interests in planning the regional energy networks,
- take part in the establishing of the regional gas market,
- strive to have one of the legs of the South-European Gas Ring pass through BiH.

## **5.2. 6. Priority 6**

### **Oil Industry Sector Promotion**

In the existing BiH economic structure, the oil industry sector encompasses imports and refining of imported crude oil and production of petroleum products. In view of the importance and the scope of its role, this sector may become one of the important factors for the successful implementation of the Medium Term Development Strategy and for the economic growth of BiH. There is a marked demand for the oil sector products in the BiH market, especially the demand for motor fuels, motor oils and industrial lubricants, and there are significant production capacities, presently not fully employed, due to import orientation, especially for motor fuels, oils and lubricants, as a consequence of the lack of a single market.

The BiH oil sector developed production and transport capacities.

Production segment comprises production organized in two refineries. The first, basic capacity is the oil refinery in Brod, where imported crude oil is refined into various products - motor fuels, liquid petroleum gas and a range of others, especially those for the needs of construction and road construction. The second of these capacities is the Refinery of Motor Oils and Lubricants in Modrica, which is essentially the next technological stage in the processing and refining of the Brod refinery products. This refinery produces high-quality motor oils, as well as various special purpose technical oils for the industry and for other industrial and commercial purposes, paraffin and various motor and other lubricants for industry, and especially transport, as well as for households.

The commercial sphere in Bosnia and Herzegovina comprises the oil products distribution capacities, especially for motor fuels, oils and lubricants. In both entities, there are two major state-owned distributors – in the Republic of Srpska one bigger distributive company has been privatized. Greater share of the market is covered by small private distributors. The demand for motor fuels on the domestic market in the present conditions is approximately 1.5 million tonnes annually; the oil refinery delivers about 1.200.000 tonnes, and the rest is imported. Considering that the number of private petrol stations is on the increase and has reached approximately 350 stations, objective estimates suggest that the commercial capacities in the oil market in BiH are already oversized.

The present state on the BiH oil products market suggests not only inadequate usage of own production capacities, and large imports of such products, but also the problems of the frequent imports of cheap low-quality products, especially motor fuels. This situation needs to be urgently addressed and the relations on the market improved.

When it comes to alternative supply and distribution network development, in addition to the undisputed “northern connection”, it will be necessary to determine the “external preconditions” in order for BiH network to develop further - meaning here the final route of the future South-European Gas Rng, as well

as the routes of other gas interconnections in the immediate surroundings. The restructuring of the sector does not prejudice the method of its actual privatization.

The production capacities for refining crude oil in Bosnia and Herzegovina are sized to 5 million tons of refined oil per year, and are based on the most up-to-date world technology. A significant step forward in the field of industry has been made by privatization and significant investments in both refineries and the distribution network. In 2011, Oil Refinery Brod processed about 1.200.000 tonnes of crude oil.

### **Legal and institutional framework**

Bosnia and Herzegovina has no law for the oil sector. In the oil sector in the Republic of Srpska, in 2009. The Law on Oil and Oil Derivatives was enacted in 2009, regulating the functioning of the oil and oil products markets, and the conditions for efficient and safe supply, as well as the formation and maintenance of operational and required reserves.

Retail sales of petroleum products are the responsibility of the entity ministries responsible for trade. Entity ministries and their inspection bodies have all the rights linked to production in the oil industry and in the performance of specific tasks.

### **Priorities**

Establish a unified legislative and regulatory network.

The oil sector can and should be a significant factor for the development of the economy of BiH and both entities. The initial improvements were already made by the adoption of the Decision on the Quality of Liquid Oil Fuels by the BiH Council of Ministers in September 2002, stipulating the obligation and the need of importing only the liquid fuels that correspond to the regulations and meet the EU quality standards.

It is necessary to harmonize the issues of the payment of taxes and other budget obligations at the entity level, and to ensure equal treatment of the companies from both entities on the oil market. This would qualitatively improve the BiH oil market and the principles of free market and healthy economic competition would come to the fore, along with the demand for quality of oil products in the market, and the economic principles and strength of overall operations of the companies. In accordance with the EU practices, already implemented in several sectors of BiH economy, a number of activities in relation to adequate restructuring and regulating must be initiated in the oil sector as well. The regulation of the oil sector should imply acceptance of the contemporary European Union practice, according to which the operating rules and the conduct of companies in this sector are regulated at the state level, while an independent regulatory body is responsible for direct approvals, i.e. licensing of companies. The key tasks in this sector are:

- adopt the BiH oil industry development policy,
- adopt appropriate legislation and regulations on the basic principles of separation of functions of production, transport, storing, distribution and trade, for the purpose of establishing an open market and secure supply with this fuel;

### **Revitalize and modernize the oil industry capacities**

In view of the difficulties in operation of the oil industry over the recent years and the low level of investment in maintenance, full revitalization of the sector was possible only under the assumption of foreign investment. The privatization of the oil sector in the Republic of Srpska was carried out in 2009; including the oil refinery in Brod, Oil Refinery Modrica, and retail network of about 70 pumping stations. After privatization, significant funds have been invested in revitalization and modernization of all three companies by the new majority owners. The processing capacity of the Brod refinery is about 2,000,000 tonnes of crude oil, which is sufficient to meet the needs of BiH for petroleum products. Oil refinery in

Modrica produces significant quantities of high quality oil, so that it is one of the leaders in the regional market.

In the oil sector, there is a marked potential for development of numerous smaller production capacities, which will further refine petroleum products and offer a range of new, specialized products in demand in the market. This is a specific area of the so-called low-tonnage chemistry, well suited for the development and growth of small and medium enterprises. In this domain, it will be necessary to:

- continue the exploration of geological oil reserves,
- establish a system of mandatory oil stocks,
- achieve the necessary quality of petroleum products,
- approximate the laws and regulations with EU standards

With an increase in the utilization rate of the existing production capacities, i.e. an increase in production in the oil sector, some positive economic effects have been achieved, which resulted in the increased employment, significant growth of profits of companies, and in the real increase in budget revenues from taxes, contributions, fees, and other budget dues. In addition, higher utilization rate of the domestic production capacities and an increase in production will ensure a better, more regular and convenient supply of domestic markets with these commodities.

The improved results in foreign trade of BiH should also be taken into account, because the imports of more expensive final oil products will be substituted by imports of cheaper crude oil.

#### **5.2.7. Priority 7.**

##### **Resolving open questions with neighbouring countries**

###### **Unlawful use of the capacity of Busko Lake in Herzegovina by HEP.**

The Treaty under which HEP got to use the hydropower resources of Busko Lake was signed in 1996 by the authorities of the former Croatian Republic of Herceg-Bosna. In this way Croatia got the right to use more than 30 dams, pumping stations, canals and bridges built in the territory of BiH, namely its municipalities Livno and Tomislavgrad. In the 70's of last century, the Busko Lake Project was carried out by the authorities of BiH and Croatia – the hydro power plant “Orlovac” was built in Croatia, and in BiH a reservoir was built over an area of about 40 square kilometers. With the 1996 Treaty, Herceg-Bosna ceded HEP the right of exploitation of water from Lake Busko, renouncing parts of the profit derived from the electricity produced. HEP made a commitment to pay the compensation for the use of submerged lands in the territory of BiH to the authorities of that country. In this way, the integrity of BiH was actually hurt and the existing contract with HEP certainly must be canceled as soon as the two countries regulate their property relations.

###### **Resolving the issue of increased withdrawal of electricity from the system HET by the Croatian national company “Hrvatska Elektroprivreda d.d.”**

Until 1992, the production of phase I of HET was divided between Bosnia and Herzegovina and Croatia in the ratio of 78%: 22%. During the war, RS was under the control of HET and then there was a change in the relationship so that the Croatian side took over the production of 50% of HPP Dubrovnik, changing the threshold of power plant in RP Trebinje to 220 kV and attaching a machine to the 110 kV network of the region of Dubrovnik. Having in mind that HET controls the water at the entrance building HPP Dubrovnik, HET practically accepted this new way of distributing electric power to putting Bosnia and Herzegovina at a disadvantage.

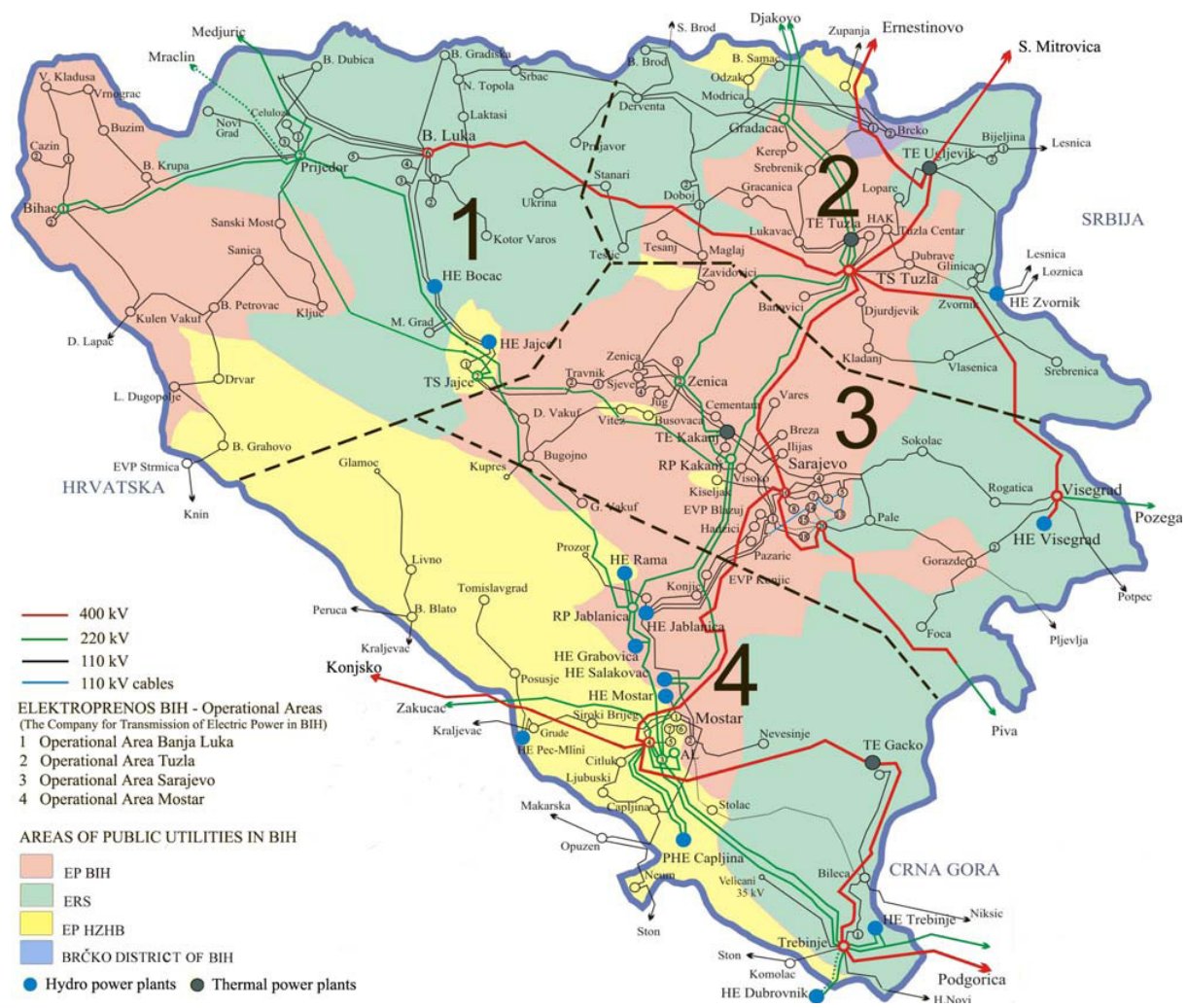
In the period from early 2002 until September 2003 several meetings were held comprising representatives of the Ministry of Foreign Trade and Economic Relations of BiH, the Ministry of Economy the Republic of Croatia, the Ministry of Economy, Energy and Development of RS, and representatives of HET and HEP in Trebinje, Dubrovnik, Zagreb, and Sarajevo, in attempt to reach an acceptable common solution. Unfortunately both sides stood by their proposals, after which the BiH side,

at the meeting held on 17.06.2003 in Dubrovnik, suggested launching of an initiative for obtaining technical assistance from the International Chamber of Commerce in Paris in order for the dispute to be resolved through international arbitration.  
 The Croatian side informed the BiH side in writing that they did not accept the resolution of disputes through arbitration and that the parties had not exhausted the possibilities of further negotiations.

**Annex I: Classification of Energy Fields of Scientific Research**

**Electric power system of Bosnia and Herzegovina**

The map of the power system of Bosnia and Herzegovina with operational areas of “Elektroprijenos BiH”, and the areas of public utilities and generation facilities.



**Basic data on the power system of Bosnia and Herzegovina**  
 (Data used: ISO BiH, Elektroprivreda BiH and Elektroprivreda u BiH)

**Larger production facilities**

Hydro power plants	Power	Installed capacity (MW)
Trebinje I	3×60	180
Trebinje II	8	8
Dubrovnik (BiH+Hr.)	2×108	216
Capljina	2×210	420
Rama	2×80	160
Jablanica	6×30	180
Grabovica	2×57,5	115
Salakovac	3×70	210
Mostar	3×24	72
Jajce I	2×30	60
Jajce II	3×10	30
Bocac	2×55	110
Visegrad	3×105	315
Pec-Mlini	2×15	30

Thermal plants	Installed power (MW)	Available power (MW)
TUZLA	715	635
G3	100	85
G4	200	182
G5	200	180
G6	215	188
KAKANJ	450	398
G5	110	100
G6	110	90
G7	230	208
GACKO	300	276
UGLJEVIK	280	250

### Basic data on the transmission system

<i>transmission lines</i>		
No.	Nominal voltage of transmission lines	Length (km)
1	400 kV	864,73
2	220 kV	1.524,8
3	110 kV	3.887,93
4	110 kV - kablovski vod	31,35

<i>interconnectors</i>		
No.	Nominal voltage of transmission lines	No. of interconnections
1	400 kV	4
2	220 kV	10
3	110 kV	22
	Ukupno	36

<i>sub-stations</i>			
No.	Type of sub-station	No. of substations	Installed capacity (MVA)
1	TS 400/x kV	9	6.090,5
2	TS 220/x kV	8	1.423,0

<i>transformers</i>			
No.	Transmission ratio	No. of transformers	Installed capacity (MVA)
1	TR 400/x kV	14	4.900
2	TR 220/x kV	14	2.100

3	TS 110/x kV	127	4.690,5	3	TR 110/x kV	216	5.204
---	-------------	-----	---------	---	-------------	-----	-------

### Basic power parameters of Bosnia and Herzegovina

(GWh)

Assessment for 2009	EP BiH	ERS	EP HZHB	Brcko BiH	distrikt BiH
Generation	6.990,00	5.635,00	1.950,00		<b>14.575,00</b>
Generation in hydro power plants	1.630,00	2.560,00	1.945,00		6.135,00
Generation in thermal plants	5.230,00	3.000,00			8.230,00
Generation in small and industrial Power plants	130,00	75,00	5,00		210,00
Consumption	4.405,00	3.554,00	3.083,00	270,00	<b>11.622,00</b>
Distribution consumption	4.035,00	3.420,00	1.350,00	270,00	9.075,00
Transmission losses					310,00
Large customers	370,00	120,00	1.725,00*		2.215,00
Consumption of mines rudnika and pumping		14,00	8,00		22,00

\*Including 876,00 GWh obtained by Aluminij as a qualified buyer

Achievement in 2008	EP BiH	ERS	EP HZHB	Brcko BiH	distrikt BiH
Generation	7.340,29	5.084,49	1.359,50		<b>13.784,28</b>
Generation in hydro power plants	1.478,17	1.931,38	1.355,20		4.764,75
Generation in thermal plants	5.749,51	3.094,41			8.843,92
Generation in small and industrial Power plants	112,60	58,70	4,30		175,60
Consumption	4.701,08	3.471,45	3.461,26	268,86	<b>12.193,15</b>
Distribution consumption	4.042,65	3.309,06	1.334,09	268,86	8.954,67
Transmission losses					326,50
Large customers	658,42	148,23	2.091,17*		2.897,83
Consumption of mines rudnika and pumping		14,15			14,15

\*Including 1223,04 GWh obtained by Aluminij as a qualified buyer

Achievement in 2007	EP BiH	ERS	EP HZHB	Brcko BiH	distrikt BiH
Generation	6.592,61	4.454,41	1.128,10		<b>12.175,12</b>
Generation in hydro power plants	1.120,10	1.780,31	1.124,09		4.024,50
Generation in thermal plants	5.365,00	2.607,16			7.972,16
Generation in small and industrial Power plants	107,51	66,94	4,01		178,46
Consumption	4.358,74	3.310,97	3.363,83	257,02	<b>11.602,56</b>

Distribution consumption	3.809,38	3.109,09	1.307,60	257,02	8.226,07
Transmission losses					312,00
Large customers	549,36	156,77	2.045,37*		2.751,50
Consumption of mines rudnika and pumping		45,11	10,86		55,97

\*Including 547,78 GWh obtained by Aluminij as a qualified buyer

<b>Achievement in 2006</b>	EP BiH	ERS	EP HZHB	Brcko BiH	distrikt BiH
<b>Generation</b>	6.401,13	5.390,49	1.883,55		<b>13.675,17</b>
Generation in hydro power plants	1.488,03	2.528,13	1.883,55		5.899,71
Generation in thermal plants	4.811,56	2.802,50			7.614,06
Generation in small and industrial Power plants	101,54	59,86			161,40
<b>Consumption</b>	4.265,62	3.309,89	3.352,60	252,60	<b>11.491,81</b>
Distribution consumption	3.722,72	3.061,31	1.279,49	252,60	8.316,12
Transmission losses					311,10
Large customers	542,90	199,50	2.053,79		2.796,19
Consumption of mines rudnika and pumping		49,08	19,32		68,40

<b>Achievement in 2005</b>	EP BiH	ERS	EP HZHB	Brcko BiH	distrikt BiH
<b>Generation</b>	5.778,53	5.200,64	1.768,69		<b>12.747,86</b>
Generation in hydro power plants	1.477,69	2.747,10	1.768,69		5.993,47
Generation in thermal plants	4.218,88	2.384,44			6.603,32
Generation in small and industrial Power plants	81,97	69,10			151,07
<b>Consumption</b>	4.190,57	3.458,33	3.469,83	252,47	<b>11.371,20</b>
Distribution consumption	3.641,86	3.254,65	1.232,47	252,47	8.128,98
Transmission losses	163,78	136,47	83,72		383,97
Large customers	384,93	20,77	2.133,31		2.539,01
Consumption of mines rudnika and pumping		46,43	20,33		66,76