

Bosnia and Herzegovina

REGULAR REVIEW 2008

Part I:

**Trends in energy and energy efficiency policies,
instruments and actors**

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EXECUTIVE SUMMARY

The Dayton Peace Agreement established a new constitution for Bosnia and Herzegovina (BiH) comprising two entities; the Federation of Bosnia and Herzegovina and Republika Srpska. The energy sector is organised on these lines with the entities being the key players coordinated at the state-wide level by the Ministry of Foreign Trade and Economic Relations (MOFTER).

At this time Bosnia and Herzegovina has no official Energy Policy or Strategy, though work is in progress at the state and entity levels to develop an energy strategy. Two projects will contribute to the development of an energy strategy for Bosnia and Herzegovina: the EC funded TASED project, which aims at compiling an energy database and energy balance model as part of its mandate and the Energy Study in Bosnia and Herzegovina, recently finished, that provides additional data. The Strategy should be completed by December 2008.

While the economy is slowly improving, with GDP growth now around 5%, industrial production is still below pre-war levels with much of the industrial infrastructure destroyed. Unemployment is high (over 40%).

Bosnia and Herzegovina is a net exporter of electricity with its generation coming from hydro plants (40%) and thermal (60%); this is expected to remain an export market for Bosnia and Herzegovina. All gas and petroleum products are imported.

Two reports address energy efficiency and environmental protection as key policy objectives. The National Environmental Action Plan (NEAP) and the Mid-term Development Strategy (PRSP) emphasise that environmental protection and energy savings are important in the fight against poverty. Both the NEAP and PRSP provide a good foundation for the development of an energy strategy for the country. However, it is imperative for these high-level policy documents to be further developed into a concrete strategy for both entities that could guide society towards a sustainable, energy efficient and environmentally acceptable energy system.

The most recent document, the Energy Sector Study in Bosnia and Herzegovina, made by the Energy Institute Hrvoje Pozar from Croatia, contains the review and synthesis of previous energy studies and also a report on new investigations. The Study reports on all findings and provides recommendations for reforming and strengthening the energy sector in order to assist Bosnia and Herzegovina to establish a national energy strategy.

The Study is providing the main elements and tendencies considered relevant in the construction of a strategy that allows Bosnia and Herzegovina to consume energy in a more efficient and sustainable way, and to supply this demand with renewable energies to the greatest extent, taking into account the protection of the environment.

The Study suggests Bosnia and Herzegovina establish a system of energy management as close as possible to that in the European Union (EU), in order to meet Bosnia and Herzegovina's commitments to the Energy Community of South East Europe (ECSEE), and with the ultimate aim of general and effective integration of Bosnia and Herzegovina into the European Union.

While the laws establishing the restructured electricity sector are in place at the state and entity levels there is as yet no gas law. Discussions are ongoing related to the future structure and regulation of the gas sector.

Key international treaties are the Energy Community Treaty for South East Europe (EnC) and the Energy Charter Treaty and the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA).

Bosnia and Herzegovina has ratified the UNFCCC and the Kyoto Protocol. By signing and ratifying these international declarations and conventions Bosnia and Herzegovina has committed itself to application of energy efficiency, use of renewable energy sources and application of different measures in environmental protection. From now on, these measures should be the cornerstone for the strategic, conceptual and practical approaches in the energy sector at the national level.

Energy prices were traditionally set by the Governments of the Entities and kept low, particularly for the household sector for social reasons. This approach is now undergoing change. Electricity regulators are established at the state and entity levels. Plans are also under way to regulate the gas sector, in compliance with the Energy Community (EnC) Treaty. Natural gas is imported and prices are mainly governed by the contract with the supplier (Gazprom) plus costs of transport and distribution. Oil and oil products are imported and the fuel market is liberalised. Typical retail prices, (March 2007) for petroleum products are in the range 1.10-1.25 USD/litre (0.70-0.80 EUR/litre).

The main consumers of energy in Bosnia and Herzegovina are households and the commercial sector (54% of total final energy consumption) and there is a significant potential for EE measures in both sectors. The majority of apartments and houses are relatively old and need substantial refurbishment. In addition, many were seriously damaged or destroyed during the war. District heating is used in the cities and can be a cost effective energy efficient solution for Bosnia and Herzegovina. Existing district heating systems, outside Sarajevo, are inefficient.

Apart from construction, cement and aluminium production, other industrial branches are still in a critical state with total consumption only at about 30% of pre-war levels. Programmes targeting energy efficiency in industry should combine awareness raising and technical assistance with provision of financing. Energy intensive industry and specific important companies should be targeted including wood processing, leather and textile processing, metal processing and food processing.

Significant measures need to be undertaken with respect to energy demand in the transport sector, especially taking into account that the primary source of energy used is imported oil products. Specific measures targeted at energy efficiency could be undertaken by specific companies of the transport sector. However it is important that energy efficiency considerations are taken seriously into account in all broader transport policies. Road and railway infrastructure, policies for renovation of fleets, improved fleet management, measures to promote public transport, etc. can affect significantly final energy demand in the transport sector.

There is, as yet, no Energy Efficiency policy in place. However, there is a growing requirement for Bosnia and Herzegovina to address energy efficiency issues through its

adoption of the EnC Treaty and Energy Charter. The energy efficiency policy is expected to be an integral part of the energy strategy now being developed. There are no energy efficiency laws in place at the state or entity level in Bosnia and Herzegovina. Only indirectly is energy efficiency covered in other legislation. Regulators, for example, have the responsibility of considering both environmental and energy efficiency issues in their tariff making and investment approval regulations and decisions.

While formal policy is not in place related to energy efficiency, we can expect that efficiency related to the residential sector will be critical due to the poor efficiency in the sector at present and its high share of total energy use; efficient lighting and product labelling are important areas. In the power sector, as Bosnia and Herzegovina attempts to develop its export potential, reducing domestic demand can be expected to be a key driver. Thermal generation plants are significant emitters in Bosnia and Herzegovina, since much of its pre war industry has been destroyed. At the same time, the coal and power industries are significant sources of employment while the overall unemployment level is estimated to be above 40%

The budgets available for addressing energy efficiency issues are very limited and compete with other critical areas of the economy for scarce funds. The primary source of financing energy efficiency investments, for the time being, is regular commercial loans. This fact, coupled with low level awareness and the difficult financial situation of many companies in industry and the services sector rank energy efficiency investments very low in priority.

Limited funds have been made available through international institutions that aim to introduce low-cost methods of saving energy when building or reconstructing buildings and district heating reform.

Bosnia and Herzegovina has a number of options in the development of alternative energy sources. These are dominated by hydro potential but also can include wind, solar, geothermal and biomass, none of which are developed to any large extent.

The first barrier to progress in the energy efficiency area is the lack of an overall energy policy for the state and at the entity levels. However, even when this is in place other barriers will emerge, the most significant of which is likely to be adequate funding for pursuing energy efficiency policies. Given this, the main drivers for energy efficiency gains are expected to be EU directives and standards. The lack of a legal framework is also a clear barrier and must be addressed urgently.

1. INTRODUCTION

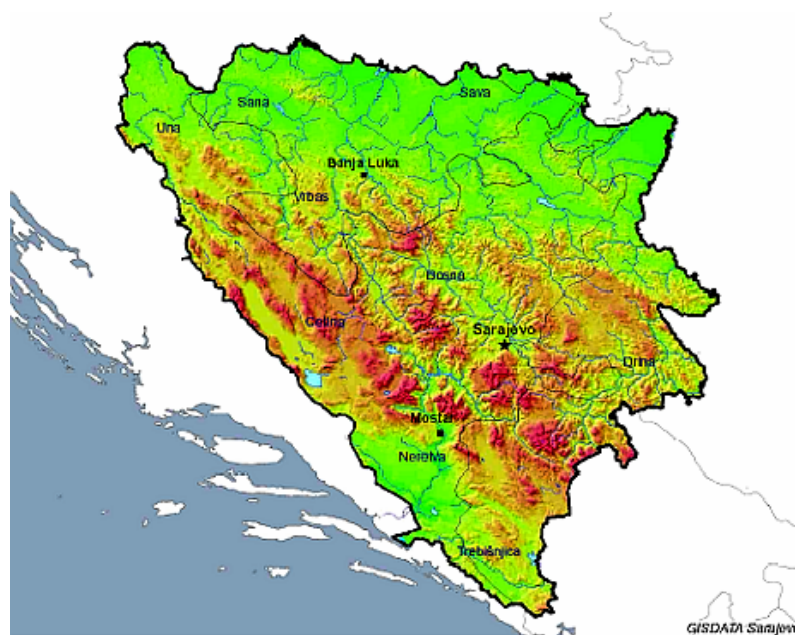
Bosnia and Herzegovina (BiH) has a land area of 51,209 km² and is situated on the Balkan Peninsula in South-eastern Europe and belongs to the “Western Balkan” countries. The country is bounded to the north, west, and southwest by Croatia and to the east and southeast by Serbia and Montenegro. The country also has a short coastline along the Adriatic Sea around the town of Neum.

Figure 1: Bosnia and Herzegovina on the Map



Bosnia and Herzegovina is a mountainous country with 62% of the land more than 700 m above sea level. The Dinaric Alps cross the country from its western border with Croatia to the southeast. The north is heavily forested, while the south has flatter areas of fertile soil used primarily as farmland.

Figure 2: Map of Bosnia and Herzegovina



The country is situated between the continental and Mediterranean climatic zones, which creates three local climatic areas. The northern inland territory has a moderate continental climate with warm summers and cold, snowy winters. The mountain areas above 700 m have a mountain climate with short, cool summers and long, severe winters with snow. The south has an Adriatic-Mediterranean climate with sunny, warm summers and short, mild, rainy winters. The average temperature in Sarajevo, in the continental zone, is -1 °C in January and 20 °C in July.

Bosnia and Herzegovina has significant water resources, which should be a key factor in the economic development of most areas in the near future. The main river is the Sava, which runs along the northern border. The Sava and its tributaries, the Bosna crossing through Sarajevo, the Una, the Drina and the Vrbas all flow to the north. Few rivers, notably the Neretva (218 km), flow towards the Adriatic Sea. Rivers also define the country's two historical provinces; Bosnia lies in the Sava river valley and Herzegovina is situated in the Neretva river basin and the upper reaches of the Drina.

Forest and woodland cover 39% of the country, meadows and pastures 20%. About 14% of the land is arable, with 5% under permanent crops. Before the war Bosnia and Herzegovina produced specialty agricultural products, such as fruit and tobacco, but it had to import more than half its food, including essential staples. Its natural resources include deposits of minerals such as salt, manganese, silver, lead, copper, iron ore, chromium, and coal.

In the latest census (1991), Bosnia and Herzegovina had 4.365 mill inhabitants and the population density was 85.5 inhabitants/km². Current population figures vary depending on the source but are estimated to be around 3.84 million. The largest cities include the capital Sarajevo, which is also an important cultural and commercial centre (population 380,000), Banja Luka (pop. 250,000), Mostar (pop. 140,000) and Zenica (pop. 135,000). Between 1991 and 2002 the population movement from the countryside to the towns increased the urban population from 40 to 60%. Bosnia and Herzegovina has three major population ethnic groups: Bosniaks, Serbs and Croats.

In 2006 the country's human development index, measured by the United Nations Development Programme (UNDP), was 0.800 (on the scale of 0.0 to 1.0). Bosnia and Herzegovina was 62nd out of 177 countries reviewed, which puts it in the group of countries with medium human development.

Before the war Bosnia and Herzegovina had a diversified economic structure. Industrial production (43%), Agriculture and Forestry (18%) and Mining (14%) were important and produced the main part of the GDP. Tourism was also well developed. Yugoslavia's military industries were heavily concentrated there, and the defence industry, producing about 40% of Yugoslavia's armaments, was a significant part of the economy.

The war devastated the country's infrastructure. During the war about 45% of its industrial plants, including about 75% of its oil refineries, were destroyed, damaged or plundered. The transport infrastructure suffered similar destruction and approximately 35% of the main roads and 40% of the bridges were damaged or destroyed.

The Central Bank of Bosnia and Herzegovina was established in 1997 and the the new national currency, the konvertibilna marka, or marka (KM), was introduced in

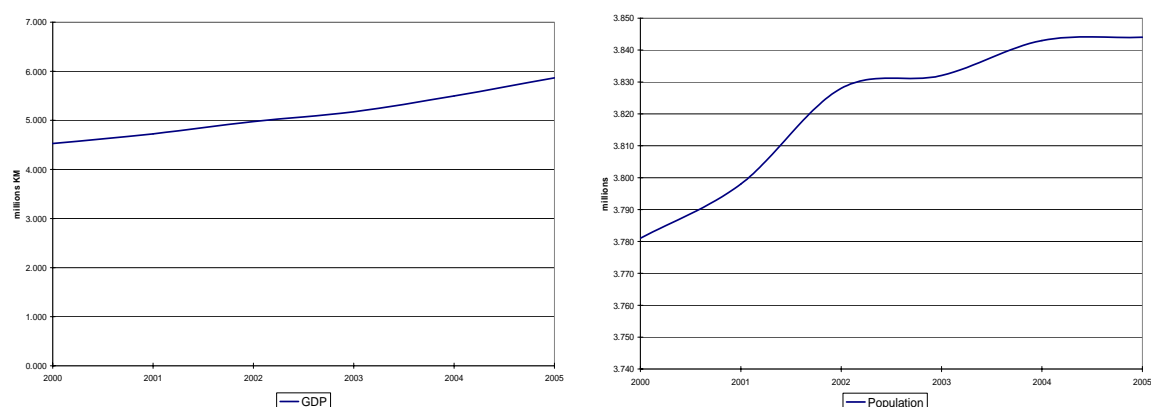
January 1998. The konvertibilna marka was pegged originally to the deutsche mark and now to the euro. Since 1997 inflation has been single-digit and the latest CPI figure for 2005 was 1.1% but rising to 4.4% in 2006.

The war caused industrial production to plunge, and in 1993 it was only about 20% of the 1989, pre-war level. Neither the end of the war nor international lending or aid has helped industry to regain its former production levels. Industrial output grew at high annual percentage rates from 1995 to 2000 and slowed down after that, but the original starting point was so low that production still remains lower than its 1989 level.

As a consequence of the war, inflation and industrial decline, unemployment soared to an estimated 70-80% in 1995. The economic recovery began after the 1995 Dayton Peace Agreement. The end of the hostilities and the very low level of economic activity during the war caused GDP to grow 54.2% in 1996. The fast growth continued until 1999 but slowed to 3.7% in 2002. Most recent estimates estimate GDP growth at 5% (2004). Registered unemployment in 2004 was still estimated at 45%; though with the grey economy included may be between 25-30%.

GDP and population are shown in the Figure 3 below.

Figure 3: Changes in GDP and Population Figures (2000-2005)



The big industrial conglomerates that dominated Bosnia and Herzegovina's pre-war economic life remain largely un-restructured and are operating at a fraction of their production capacity. While 90% of registered companies are in private hands, the big conglomerates remain under State ownership.

The Dayton Peace Agreement established a new constitution for Bosnia and Herzegovina. It also established a united Bosnia and Herzegovina made up of two entities, the Federation of Bosnia and Herzegovina and Republika Srpska. The District Brčko is under direct jurisdiction of the administration of the State.

The Parliamentary Assembly has two chambers, the House of Representatives and the House of Peoples. The Parliamentary Assembly adopts laws and decides on the budget of the State institutions. The Presidency ratifies international treaties after approval of the Parliamentary Assembly. All legislation requires the approval of both houses. The Presidency is responsible for the foreign policy of the country and the Council of

Ministers has power over foreign trade and foreign affairs, but in general all government functions not expressly given to it lie with the entities.

The Federation of Bosnia and Herzegovina has its own constitution, a bicameral parliament and a government headed by a Prime Minister, who is nominated by the Parliament. The significant centres of political power in the Federation are the ten cantons, which have their own parliaments and governments.

Republika Srpska has a unified governmental structure, a unicameral People's Assembly and a directly elected president.

The highest judicial authority in Bosnia and Herzegovina is the Constitutional Court. Both entities have their Supreme Courts supplemented by cantonal and municipal courts in the Federation of Bosnia and Herzegovina and municipal courts in Republika Srpska.

The Office of the High Representative (OHR) was established as a result of the Dayton Peace Agreement to oversee the implementation of its civilian aspects and to coordinate the activities of the civilian organisations and agencies operating in Bosnia and Herzegovina. Initially the OHR was a significant player in the governance of Bosnia and Herzegovina, however, as time progresses OHR is reducing its visibility and influence, including that of the High Representative (HR). Indications are that the post of HR will be retained until mid 2008. At the same time as the OHR is preparing for its closure, the European Union is increasing its commitment to Bosnia and Herzegovina. The EU Special Representative, who has a mandate to promote overall EU political coordination among other things, will remain in Bosnia and Herzegovina after the closure of the OHR.

EU accession is a strategic priority for Bosnia and Herzegovina. Energy sector reform with the purpose of integrating Bosnia and Herzegovina in the single energy market of the South-East European countries, as well as approximation to the EU, lead Bosnia and Herzegovina to a viable economic development. Energy sector reform is followed by realisation of the activities from the list of priorities of the European Partnership. Therewith, the state clearly defined energy as the key segment of the development of this country.

2. BACKGROUND: ENERGY POLICIES AND PRICES

2.1. Energy Sector

The energy sector in Bosnia and Herzegovina is characterised by the high energy intensity in comparison with developed EU countries, which is the key indicator of the effects of energy utilisation. In 2005, Bosnia and Herzegovina primary energy intensity (gross total primary energy supply per unit of GDP) was 0.938 toe/USD 2000, which is 2.5 times more than the amount in the EU 27 countries and more than in almost all countries in the region.

This indicates that there is considerable room for energy rationalisation.

Figure 4: Energy Intensity in Bosnia and Herzegovina (2000-2005)

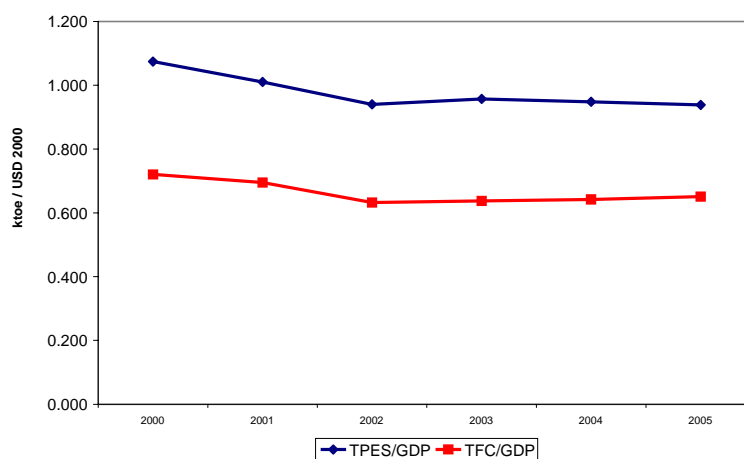
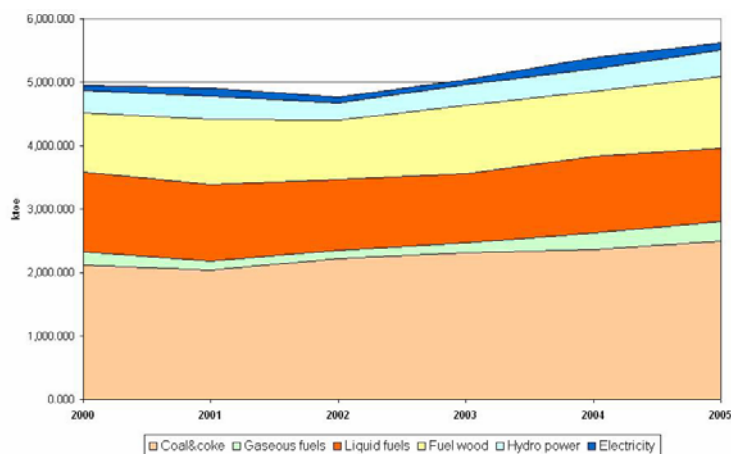


Figure 4 illustrates primary and final energy intensities, where energy intensities are determined through total primary energy supply and total final consumption per unit of gross domestic product, expressed in ktoe/USD 2000.

Total primary energy supply in 2005 was 5,505 ktoe, and it increased by 13.17% in the past five year period. The energy mix in TPES from 2000 to 2005 is shown in Figure 5.

Figure 5: Total Primary Energy Supply in Bosnia and Herzegovina (2000-2005)

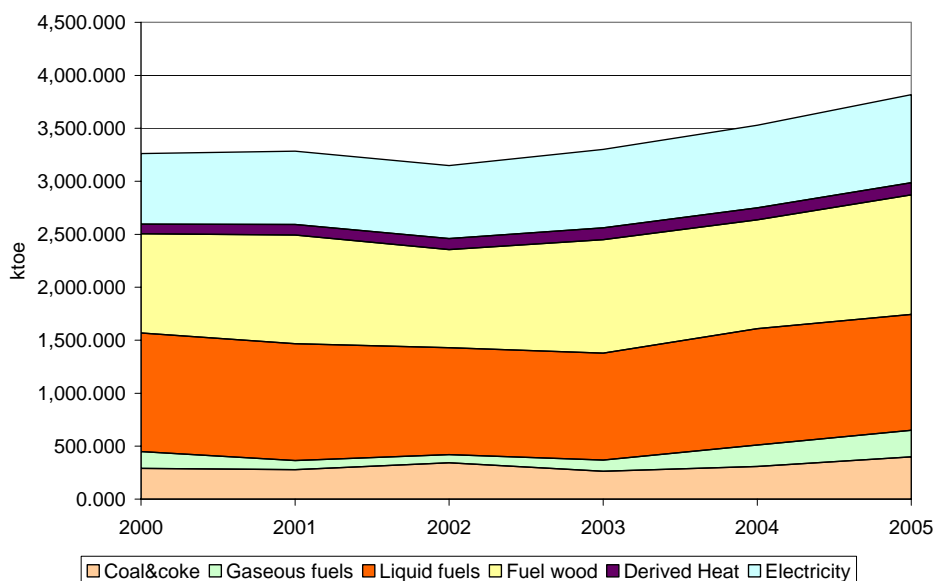


Total energy consumption in Bosnia and Herzegovina was decreasing until the year 2002, when an intensive increase in consumption was recorded, so that the average annual consumption growth rate in the period 2000-2005 was 2.5%. At the same time, an average annual growth rate of primary energy production was 3.4%, while the growth rate of energy imports was 2.8%. The fastest growth was recorded in the export of energy, with an annual growth rate of 8.8%.

Total energy consumption in Bosnia and Herzegovina is assured from own production of primary energy and also by importing primary and transformed energy. Also, Bosnia and Herzegovina exports some energy forms. Consequently, in the period from 2000 to 2005, Bosnia and Herzegovina has varied from 71% to 79.1% of its total energy demand from its own primary energy production. In the same period, the share of imports was between 30.1% and 38.6% in relation to total consumption. Energy exports as a percentage of total energy consumption varied from 8.4% to 12.7%.

Figure 6 shows TFC in the period 2000-2005. Consumption of energy increased by around 17% in that period. Total final consumption in Bosnia and Herzegovina in 2005 was 3,818.3 ktoe and in 2000 was 3,262.6 ktoe.

Figure 6: Total Final Consumption in Bosnia and Herzegovina (2000-2005)



The **coal sector** is a very important part of the energy sector and the economy of Bosnia and Herzegovina. It accounted for approximately 50% of the country's primary energy supply in 2005. Coal is also the main energy source for electricity production.

The geological coal reserves in Bosnia and Herzegovina are estimated at 5.6 billion tons, of which the proven reserves are estimated at 2.5 billion tons (1.4 billion tons of lignite and 1.1 billion tons of brown coal). The exploitable reserves are estimated at 1.6 billion tons. Coal production in 2006 was 8.062 million tons (9 million tons or 2.5 million tons oil equivalent in 2005) so it is evident that there is considerable potential to increase output.

The coal produced in the Bosnia and Herzegovina is brown coal and lignite. The brown coal is of relatively good quality, with an average calorific value (CV) of approximately

16.750 kJ/kg. However, it has sizable quantities of sulphur, ash and humidity, which affect the area of its consumption, because of transport and environmental issues. On the other hand, the lignite is high quality and clean, with CV from 7500 to 12600 kJ/kg, which allows widespread use.

The consumption of coal can be divided in two categories: for electricity generation in the thermal power plants with about 85% going to the Thermal Power Plants (TPP); and that used in industry, district heating and households, for heating and other purposes, which is usually described as final consumption. Some coal is also exported from Bosnia and Herzegovina.

The **gas sector** in Bosnia and Herzegovina is relatively small. Only a few parts of the country currently have access to gas supplies. The sector is organised with BH-Gas acting as a single importer, with the gas supplied by Gazprom from the Russian Federation. Gas consumption in 2005 was 380.5 million cubic metres (mcm), or 309 thousand tonnes oil equivalent (ktoe).

Oil sector: There are over 550 distributors involved in the industry and few statistics are collected on their operations. Bosnia and Herzegovina imports both crude oil and petroleum products. The crude oil is refined at the Bosanski Brod oil refinery. There is also a smaller refinery in Modrica which produces motor oils and other products.

Electricity: The total installed capacity in Bosnia and Herzegovina is 3,924 MW, of which the large hydro power plants (HPP) account for 54.2%, thermal power plants (TPP) 45%, and small HPP and industrial plants 0.8%. In 2006, total annual production of electricity was 13.627 TWh., with 56% generated from coal and 43% from hydro. This level of production, for the time being, covers consumption needs in Bosnia and Herzegovina, while some electricity is also exported (3,585 GWh in 2005).

2.2. Energy Sector Reform

The process of electricity sector reform in Bosnia and Herzegovina was initiated by signing the Statements of the entity governments on the electricity policy (in 2000) and was continued by the adoption of the *Act on Transmission of Electric Power, Regulator and System Operator of Bosnia and Herzegovina* and the Entity laws on electricity (in 2002). With the adoption in 2004 of the *Law Establishing the Company for Transmission of Electric Power in Bosnia and Herzegovina*, and the *Law Establishing an Independent System Operator for the Transmission System*, Bosnia and Herzegovina commenced the reform of the electricity sector in practice.

The aforementioned laws identify the key subjects responsible for their implementation: the Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina, Entity Ministries in charge of energy, the State Electricity Regulatory Commission, the Entity Regulatory Commissions, and all of the power entities.

The adopted acts put in place formal assumptions for power sector restructuring and reforming. The state or entity regulators, bound by these acts, as well as responsible power companies have brought or are about to implement a number of regulations from their respective scope of competences (third party access, electric power activity

licensing, tariff issues, customer protection, market opening and functioning, system operation, metering, etc.).

During the process of the electricity sector reform, the *Independent System Operator in Bosnia and Herzegovina*, and the *Company for Transmission of Electric Power in Bosnia and Herzegovina* started to operate in July 2005 and in February 2006 respectively.

By its participation in the Athens process and by signing the Treaty Establishing the Energy Community in October 2005, Bosnia and Herzegovina expressed its stance with regard to energy sector reforms, electricity market opening, and harmonisation of its policy and legislation with the European Union, which required and will require significant institutional, legislative, and structural changes.

Today, the electricity market in Bosnia and Herzegovina has not yet started to operate effectively, despite a high level of legal framework definition. The new commercial power companies are still forming in Bosnia and Herzegovina, there are still no market levels of electricity prices, or ability to change electricity supplier.

2.3. Energy Policy – General Trends and Objectives

There is as yet no specific State energy policy or strategy, though the process is in place for their development through the EC funded TASED project (CARDS 2005). The first draft of the Energy Strategy of Bosnia and Herzegovina is scheduled to be available by the end of 2008 giving Bosnia and Herzegovina, among other things, recommendations on how to improve Energy Efficiency (EE). Neither the Federation of Bosnia and Herzegovina nor Republika Srpska have yet developed an energy strategy at the entity level, but are in the process of doing so.

The National Environmental Action Plan (NEAP) and the Mid-term Development Strategy (PRSP) emphasise that environmental protection and energy savings are important in the fight against poverty. The energy priorities in the Mid-term Development Strategy, which are broadly similar to those in the Federation's draft strategy discussed above, constitute a first step towards a national energy strategy.

The NEAP deals with the energy sector at a general level; however, it proposes the following energy-efficiency (and thereby emission-reducing) measures:

- Development of a programme of stabilisation and gradual decrease in the emission of greenhouse gases by improving energy efficiency through technology restructuring, better use of energy sources and increased use of renewable energy sources; and
- Preparation of a development strategy for the energy sector that would provide balanced consumption of domestic and foreign energy resources and maximise the use of renewable sources.

Neither the entities nor the State have yet taken concrete steps to develop such programmes and strategies following the NEAP.

The adopted Poverty Reduction Strategy Papers (PRSP) set out the goals of energy sector reform. Among them are the following goals, which are directly or indirectly related to EE:

- (i) enhance cost-effectiveness and rational use of energy sources and improve energy efficiency;
- (ii) ensure protection of the environment in accordance with national and international standards;
- (iii) increase the use of renewable energy sources;
- (iv) meet the conditions of the European Energy Charter Agreement, as well as other international contracts and agreements.

Priorities defined in the PRSP have not been implemented with the exception of certain initiatives for the promotion of small hydro power plants (SHPP).

The most recent document, the Energy Sector Study in Bosnia and Herzegovina, made by the Energy Institute Hrvoje Pozar from Croatia, contains the review and synthesis of previous energy studies and also a report on new investigations. The Study reports on all findings and provides recommendations for reforming and strengthening the energy sector in order to assist Bosnia and Herzegovina to establish a national energy strategy.

The Study is providing the main elements and tendencies considered relevant in the construction of a strategy that allows Bosnia and Herzegovina to consume energy in a more efficient and sustainable way, and to supply this demand with renewable energies to the greatest extent, taking into account the protection of the environment.

The Study suggests Bosnia and Herzegovina establish a system of energy management as close as possible to that in the European Union (EU), in order to meet Bosnia and Herzegovina's commitments to the Energy Community of South East Europe (ECSEE), and with the ultimate aim of general and effective integration of Bosnia and Herzegovina into the European Union.

Summary Table I: Priority of Policy Objectives

| Policy objective | Mark |
|---|-------------|
| Reduce total final consumption / GDP | 3 |
| Reduce dependency on energy imports | 4 |
| Diversification of fuels | 2 |
| Reduction of CO ₂ | 5 |
| Increase utilisation of indigenous primary energy sources | 1 |

Note that the figures at this stage are provisional only. Actual ranking of policy objectives will be guided by the energy strategy in preparation.

2.4. Energy Policy Implementation

At the State level, the key players are:

- Ministry of Foreign Trade and Economic Relations (MoFTER); in accordance with the Law, MOFTER's responsibility is "for activities and tasks within the jurisdictions of Bosnia and Herzegovina and which are related to policy defining, basic principles, coordination of activities and harmonisation of entities' authoritative bodies and institutions on the international level in the field of agriculture, energy, environment protection, development and usage of natural resources and tourism."
- Transmission System Operator (TRANSCO)
- Independent System Operator (ISO)
- State Electricity Regulatory Commission (SERC)

At the Entity level, the key players at the government level are:

- Ministry of Energy, Mining and Industry of FBiH (MEMI)
- Ministry of Economy, Energy and Development of RS (MEED)
- Federal Electricity Regulatory Commission (FERC)
- Regulatory Commission for Energy of RS (RERS)

At the entity operating level the key companies are:

- The three power utility companies currently responsible for generation and distribution: Elektroprivreda BiH, Elektroprivreda RS and Elektroprivreda HZ HB.
- The gas utility companies responsible for transmission and distribution, currently the companies operating in Sarajevo, Lukavica, Visoko and Zvornik.
- The district heating companies operating in the major cities, primarily Sarajevo, Banja Luka, Zenica and Tuzla.

In terms of governing law, there are a number of laws that are considered the cornerstones of the electric sector development in Bosnia and Herzegovina. At state level the following have been adopted:

- Law on Transmission of Electric Power, Regulator and System Operator of Bosnia and Herzegovina (Official Gazette Bosnia and Herzegovina 7/02)
- Law Establishing an Independent System Operator for the Transmission System of Bosnia and Herzegovina (Official Gazette Bosnia and Herzegovina 35/04)
- Law Establishing the Company for the Transmission of Electric Power in Bosnia and Herzegovina (Official Gazette Bosnia and Herzegovina 35/04)
- Grid Code (Official Gazette Bosnia and Herzegovina 48/06)
- Market Rules (Official Gazette Bosnia and Herzegovina 48/06)

At the entity level, the following laws have been adopted:

- Federation of Bosnia and Herzegovina Law on Electricity (Official Gazette Bosnia and Herzegovina 41/02)
- Republika Srpska Law on Electricity (Official Gazette RS 66/02)

Additionally, at the Entity level, Action Plans for Restructuring the Power Sector were adopted by the respective parliaments in 2002 (RS) and 2004 (FBiH). The Action plan for Restructuring the Power Sector of RS has been in force since 2003 (Official Gazette 69/03) and Action Plan for Restructuring the Power Sector of FBiH, was updated and revised and it has been in force since June 2005.

A gas legal framework is in place at the entity level. There are ongoing activities on harmonisation of this legislation with the provisions of the SEE Energy Community Treaty.

In addition to the state and entity laws there are a number of Treaties and Agreements at International level that will influence the development of Bosnia and Herzegovina policies and their implementation. The key documents applicable at the international level are the Energy Community Treaty (EnC), the Energy Charter Treaty with the Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA).

Energy Community Treaty for South East Europe (EnC)

Bosnia and Herzegovina has entered into international agreements in the energy field. The most important is the Agreement on Establishment of the Energy Community which has been ratified and entered into force on the 1st of July, 2006.

The basic goals of the EnC are the creation of a stable and single regulatory framework and market space, which enables a reliable supply of energy products and also attract investments into the energy sector, especially electricity and natural gas. Competition is seen as a critical item in terms of supply, such as alternative routes of gas supply for example. The overall objective is to improve the availability and security of supply to SEE citizens and achieve a corresponding improvement in the quality of life. Environmental protection, energy efficiency and conservation are seen as an integral part of the process, including the development of renewable resources.

By concluding this Agreement, contracting parties from the region commit to establish a common electricity and gas market among themselves, which will function in accordance with the standards of EU energy market, with which it will eventually be integrated. This is to be achieved by gradual takeover of parts of the so-called *acquis communautaire* (legal heritage) of the EU, pertaining to energy, environment protection and competition. It is a matter of implementation of relevant EU directives and regulations for energy and environment protection.

By participating in this process, Bosnia and Herzegovina confirms its commitment to energy sector reform, energy market liberalisation and harmonisation of its policy with the EU Member Countries.

Energy Charter Treaty with the Protocol on Energy Efficiency and Related Environmental Aspects: (PEEREA)

Bosnia and Herzegovina is also a signatory member of the Energy Charter Treaty with the Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA).

Kyoto Protocol

Bosnia and Herzegovina has ratified the Kyoto Protocol.

2.5. Energy Prices

2.5.1. Energy pricing policy

Energy prices were traditionally set by the Governments of the Entities and kept artificially low, particularly for the household sector for social reasons. For example, natural gas is slightly cheaper for households than for large consumers. This approach is now undergoing change. Electricity regulators are established at the state and entity levels. The state regulator is responsible for the wholesale supply market, while the entity regulators are responsible for generation, distribution and supply at the retail levels. Approved methodologies of tariff determination are in place. The tariff setting methodology aims at reducing cross subsidies, while at the time taking into account the needs of the most vulnerable consumers. The jurisdiction of the Regulatory Commission in Republic of Srpska is extends over the whole gas sector. On the other hand, in other Bosnia and Herzegovina entities, the responsible ministry has the role of regulatory commission. Plans are also under way to harmonise regulatory framework for the gas sector in compliance with the Energy Community (EnC) Treaty.

The liquid fuel market is 100% liberalised in Bosnia and Herzegovina. The Bosnia and Herzegovina Council of Ministers, in September 2002, adopted the Decision on the Quality of Liquid Oil Fuels “stipulating the obligation and the need of importing only the liquid fuels that correspond to the regulations and meet the EU quality standards.” This Decision defines the conditions of quality, which liquid fuels used in internal combustion engines and liquid fuels used for heat generation must fulfil across the entire territory of Bosnia and Herzegovina. The standards for determination of liquid fuels properties and way of labelling and evidence of quality are defined in the Decision.

Responsibility for setting energy prices generally rests at the entity level and in the Federation of Bosnia and Herzegovina – at the cantonal levels. This applies to wood fuel and district heating, for example. Natural gas prices are set by the entity government.

2.5.2. Price levels

Electricity prices are set by the Entity Regulators FERC and RERS. The prices are slightly different based on each EP’s service area. Tariffs are dependent on time of day, as well as on seasons. Tariffs for household consumers range from around

4.5 Euro cents per kWh in summer time to around 6 Euro cents per kWh in the winter. A typical large consumer connected at 35kV pays between 2 and 5 Euro cents per kWh depending on time of day and season for energy in addition to a demand charge (year 2007). Full details on tariffs are published on the websites of the regulators.

The Entity Government determines the price of coal for electric energy generation in Bosnia and Herzegovina. According to the Bosnia and Herzegovina government decision from 2006, the price of coal used for TPPs needs was 4.5 KM/GJ (about 2.25 EUR/GJ). This price can be reduced if coal is used for exported electricity and it is the subject of contract between the EP BiH and the mines. 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. The price of coal used for other purposes is liberalised, and depends on the type of coal and its heating value.

All natural gas is imported and prices are dictated by the contract with the supplier (from the Russian Federation), by transport (through Ukraine, Hungary and Serbia) expenses and distribution expenses. The main consumer of natural gas is Canton Sarajevo and the selling prices in 2007 (per standard m³ – including tax) were:

| | |
|----------------------------|----------------------------|
| For households | 0,708 KM (around 0.36 EUR) |
| District heating companies | 0,720 KM (around 0.37 EUR) |
| For commercial consumers | 0,918 KM (around 0.47 EUR) |
| For industry | 0,907 KM (around 0.46 EUR) |

Oil and oil products are imported. The prices for oil products are liberalised and depend on the prices of imported oil and oil products. There are several elements, besides the imported price, included in the prices of oil products, such as custom duties, commercial margin and taxes. As an example, the retail prices per litre (in USD/litre tax included) for oil derivatives are given below (March 2007):

| Product | Retail price |
|-------------------------------|------------------------|
| Unleaded motor gasoline MB-95 | 1.19 (around 0.90 EUR) |
| Diesel D-2 | 1.23 (around 0.92 EUR) |
| Light fuel | 1.12 (around 0.84 EUR) |

Energy prices in the electricity sector are regulated. Subsidies are available at the Cantonal level in FBiH. In December 2007, the Government of the RS issued the Decision on Adoption of the Programme for Protection of Socially Vulnerable Categories of Electricity Consumers for 2008. Cross subsidies between consumer categories exist, mainly from the larger consumer towards the smaller consumer, although these are being addressed in the electricity sector and modified over time. Energy consumption is taxed through the normal taxation system, with VAT (PDV) at 17%. There are no direct taxes related to CO₂ emissions.

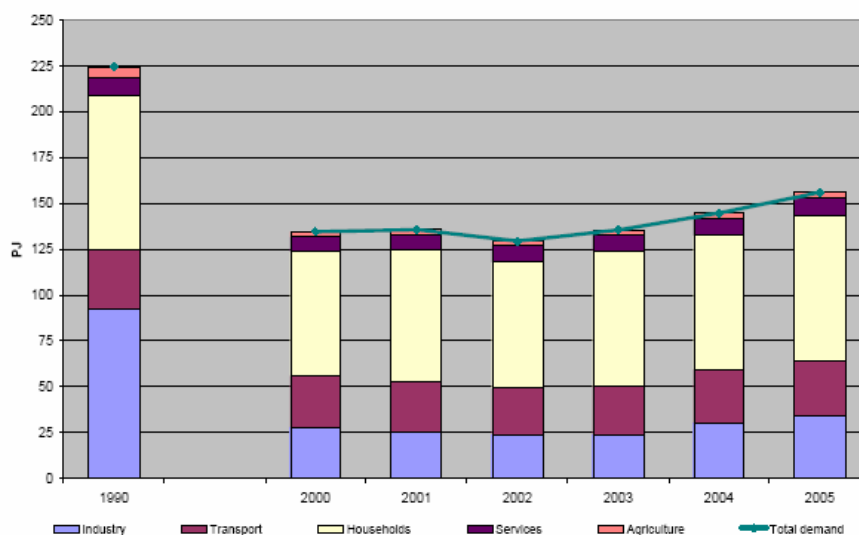
Summary Table II: Energy Prices

| Energy Prices | Yes | No | Partly |
|---|------------|-----------|---------------|
| Is there an independent regulator of energy prices? | | | x |
| Are there any subsidies on energy prices? | | | x |
| Are there any cross-subsidies? | | | x |
| Are the environmental costs fully internalised? | | x | |
| Do you have a tax related to energy consumption? | | | x |
| Do you have a tax related to CO ₂ emissions? | | x | |

3. END-USE SECTORS

Final energy consumption in sectors of industry, transport, households, services and agriculture is shown in Figure 7. Sectoral shares in final energy consumption were quite stable and didn't change significantly during the 2000-2005 period.

Figure 7: Final Consumption in Bosnia and Herzegovina, by Sector (2000-2005 period compared to 1990)



3.1. Residential Sector

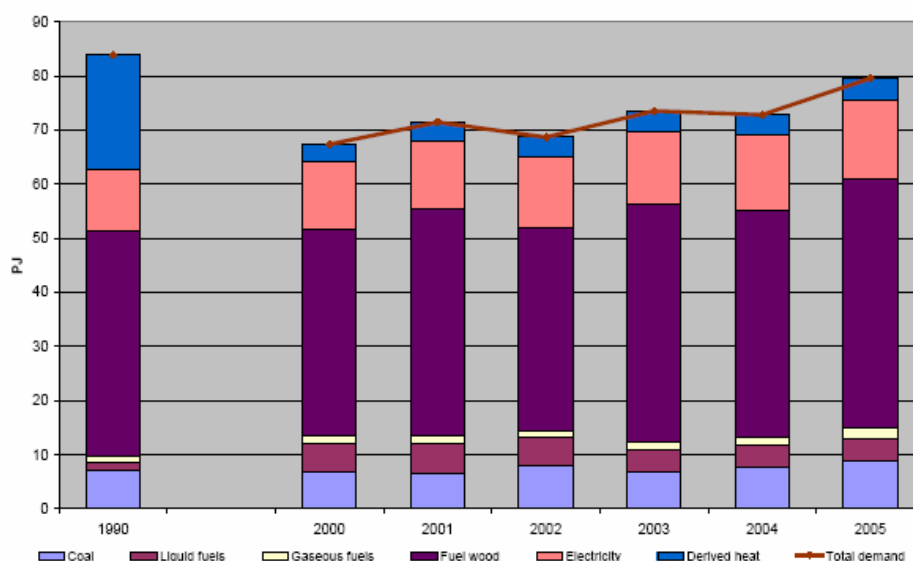
The main consumers of energy in Bosnia and Herzegovina are households (51% of total final energy consumption). There is a significant potential of energy efficiency measures in this sector. The average annual growth rate of household energy consumption was 3.4% from 2000 to 2005.

Use of different energy forms in the residential sector is shown in the Figure 8.

Consumption of natural gas grew at the fastest rate but only a very small amount of gas is used in households. Consumption of liquid fuels decreased while other forms of energy increased at the following rates: fuel wood 3.8%, electricity 3%, coal and coke 5.8%, and heat from public heating plants 4.6%.

The majority of housing stock in Bosnia and Herzegovina was constructed prior to the war. According to the 1991 census data, Bosnia and Herzegovina had 1,294,863 housing units. The majority of these apartments and houses are already relatively old and need substantial refurbishment. In addition many of these houses were seriously damaged or destroyed during the war. For example, data for Sarajevo show that the average age of housing units is 25 years, 55% of them were partly damaged and 8% completely devastated during the war. International donors have been engaged in the rehabilitation process after the war but they mainly focus on covering urgent housing needs.

Figure 8: Final Consumption in the Residential Sector, by Energy Source (2000-2005 period compared to 1990)



The existing regulations and standards as well as the current policies for civil engineering, construction and building industry do not promote energy efficiency in new constructions and energy systems. Where old standards exist, they are not always implemented in practice as the enforcement mechanisms are weak. In addition the population is not aware of the cost- effectiveness of EE construction patterns, especially in new constructions.

As a result, most new and reconstructed buildings and installations do not meet modern EE standards. Many new houses are not thermally insulated while a number of them are even left without external plastering, especially in rural and in suburban areas. Considering that space heating is the largest share of energy use in buildings and that specific energy consumption for heating is considerably higher than in EU countries, it is clear that there is a very significant potential for energy efficiency improvement and energy savings with measures such as insulation, double glazing, central heating, etc. In the Sarajevo region, where a number of flats use gas central heating systems with older (pre-war) gas boilers, new improved boilers of much higher efficiency (even condensing boilers) could be promoted.

District Heating

District heating (DH) facilities fall under the responsibility of municipal (RS) and cantonal authorities (FBiH). There is no regulatory oversight of the DH sector at state level. In general, there is no systematic information base on the DH sector with the exception of the two large DH systems of Sarajevo and Banja Luka.

DH can be a cost effective and EE solution in Bosnia and Herzegovina. Many towns and cities have blocks of flats with dense population and therefore low heat transportation losses. Increased use of district heating, especially with the introduction of CHP, instead of individual household heating would improve efficiency and substitute thermal electricity uses.

Despite its importance, the necessary reforms and investments for rationalisation and modernisation of the DH systems have not been implemented. Existing DH systems are very inefficient. As an example space heating average energy consumption in the Sarajevo DH is reported to be 140-160 kWh/m² for domestic heating. The average in Western Europe would be 90-120 kWh/m² for similar climatic conditions.

Out of the over 20 district heating systems in Bosnia, only the Sarajevo DH system (supply side) has been reasonably rehabilitated in the last decade. Even in the case of Sarajevo DH significant losses occur in the consumer's internal installations. Limited rehabilitation works are also reported in other DH systems such as Tuzla, Doboje and Banja Luka. With the exception of Sarajevo, virtually all of the other district heating systems suffer high energy losses – which in many cases exceed 60%.

High energy losses coupled with low collection rates of energy bills and the artificially low prices of heat constitute serious problems for the financial situation of the DH companies. Shortage of financial resources and lack of investments eventually affect the quality of services. Low quality DH services lead consumers to other more polluting but more reliable energy forms, while the DH systems cannot expand to supply more consumers.

Waste of energy at the consumer level is another serious problem. Billing by square meter, without individual metering does not give any incentive to consumers to save energy or reduce losses. A recently adopted Law on Consumer Protection states that the supplied energy charges must be based on individual actual consumption. As a result of that, the system must be switched to individual metering. This is a priority for better quality of services and better management of the DH systems (MUNEE 2006).

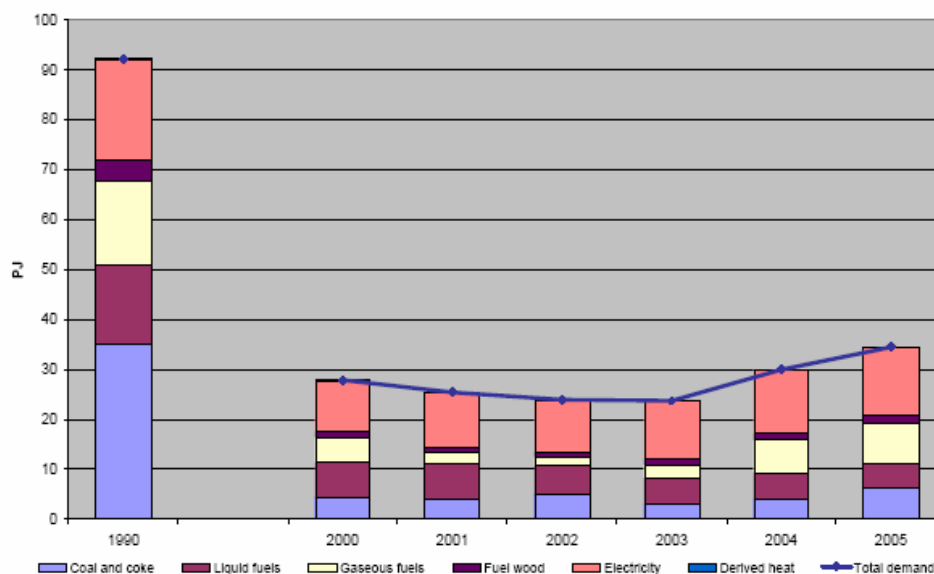
The Sarajevo District Heating System plans to introduce certain energy efficiency measures by investing approx. EUR18 millions. The planned interventions include a metering system of heat consumption in 750 locations, reconstruction of roof boiler rooms (block heating) aiming at 10% up to 15% savings and satisfying air pollution limits, installation of thermostatic valves, etc.

3.2. Industrial Sector

Energy sources for supplying industry in Bosnia and Herzegovina are electricity, liquid fuels, coal and coke and natural gas. Role of fuel wood as well as district heat is practically irrelevant.

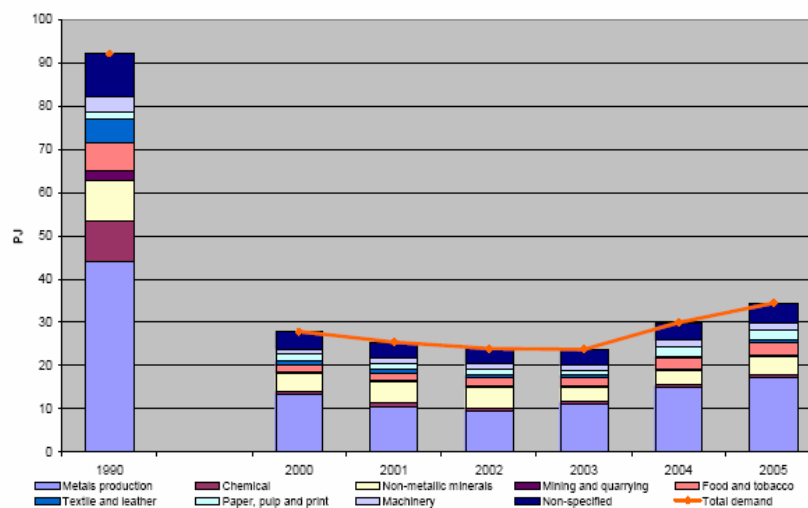
During 2000-2005, energy consumption by industry in Bosnia and Herzegovina increased by an average annual rate of 4.4%. A decrease was achieved only in fuel wood consumption which fell at an average annual rate of -7.5%. Consumption of all other forms of energy increased. Consumption of electricity increased by an average annual rate of 6.1%, coal and coke consumption by a rate of 7.9% and natural gas consumption by an average annual rate of 10.4%. In consumption of energy sources which had very low shares – fuel wood and heat – a relatively high growth rate of consumption of 3.1% to 9.4% was seen.

Figure 9: Final Consumption in the Industry Sector, by Energy Source (2000-2005 period compared to 1990)



Energy consumption in industry can be observed in relation to industrial branches as shown in Figure 10. The largest share of energy consumption in industry was achieved by metal production with the share between 39.6% and 49.6%, where the lowest share was in 2002. More significant shares in energy consumption have been achieved by non-metal, mineral, and other industry, which includes energy consumption in the construction industry. In the textile and leather industry and in energy consumption of mining and quarrying, consumption fell on average. All other industrial branches saw growing energy consumption at the following average annual rates: metal production 5%, chemical industry 4%, food, liquor and cigarette industry 2.1%. Energy consumption in non-metal minerals was largely unchanged.

Figure 10: Final Energy Consumption, by Industry Branch (2000-2005 period compared to 1990)



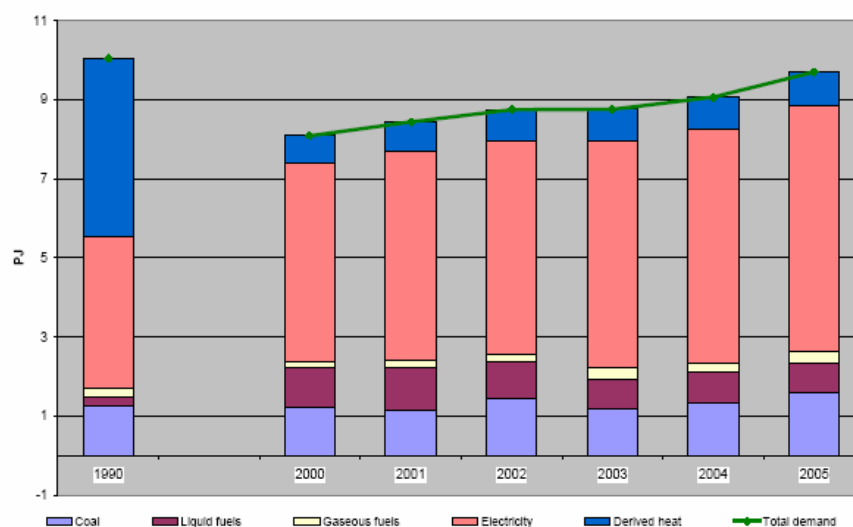
Generally, there is lack of awareness about energy management and energy savings, low level of technology in terms of energy efficiency and poor maintenance conditions. According to expert opinion, industrial companies currently are not truly aware of the cost of energy, fail to appropriately manage these costs or pay attention to energy saving measures. Electricity tariffs for industrial customers connected to high and medium voltage systems are already high and comparable with prices in the EU. Small enterprises also pay relatively high rates. Some companies have reacted to such high prices of electricity by introducing control and automation systems in order to control and decrease peak power. High prices of oil and oil derivatives will also further encourage companies to switch from oil boilers to other sources such as wood/wood waste boilers but this may lead to increases of biomass costs.

As previously mentioned, the programmes targeting energy efficiency in industry should combine awareness raising and technical assistance with provision of financing opportunities for EE investments.

3.3. Services Sector

The largest share in energy consumption in the service sector was achieved by electricity with a share rising from 61.9% to 65.9%. The share of coal and coke ranged from 13.5% to 16.4%, while the share of liquid fuels has been decreasing gradually from 12.4% in 2001 to 7.6% in 2005. The share of heat was rather stable, ranging from 8.5% to 9.0%. The lowest share in energy consumption for the service sector was achieved by natural gas, ranging from 2.1% to 3.1%. Finally, energy consumption in the service sector is shown in Figure 11. The average annual growth rate in the service sector was 3.7%.

Figure 11: Final Energy Consumption in the Services Sector, by Energy Source (2000-2005 period compared to 1990)



Since great construction of new non-housing buildings is expected in the service sector by 2020, and likewise an increase in the standards of heating and air-conditioning, with the measures of energy efficiency it is possible to achieve a decrease in thermal needs up to 10%, and in the non-thermal ones up to 5%.

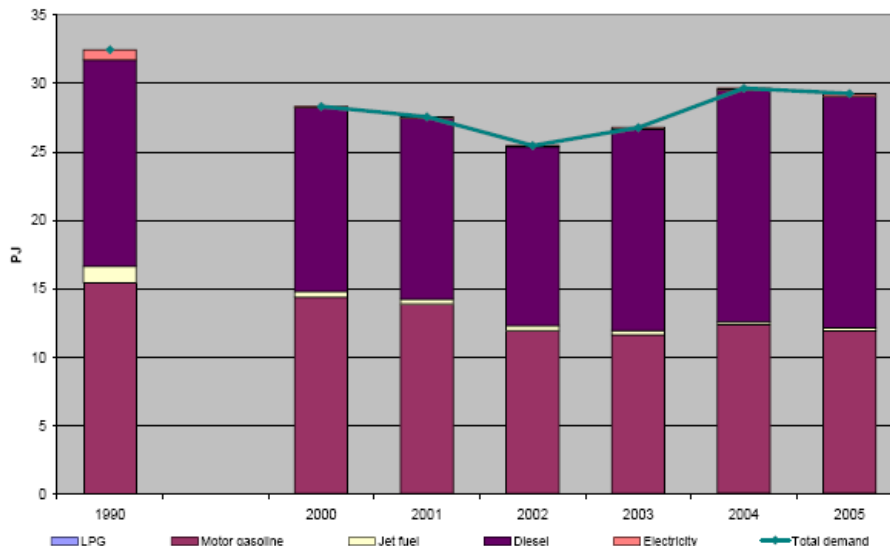
The comments made above with respect to the household sector apply to a significant extent to the services sector, which includes a large number of single owner small businesses.

3.4. Transport Sector

Significant measures need to be undertaken with respect to energy demand in the transport sector, especially taking into account that the primary source of energy used is imported oil products. Specific measures targeted at energy efficiency could be undertaken by specific companies of the transport sector. However it is important that energy efficiency considerations are taken seriously into account in all broader transport policies. Road and railway infrastructure, policies for renovation of fleets, improved fleet management, measures to promote public transport, etc. can affect significantly final energy demand in the transport sector.

Final energy consumption in transport of Bosnia and Herzegovina with shares of consumption is shown in Figure 12. Transport energy consumption achieved a slight growth trend of 0.6%. Transport diesel consumption increased by an average annual rate of 4.7%, while motor gasoline consumption was decreasing by an average annual rate of -3.8%. When it comes to other forms of energy, growth was seen in liquid petroleum gas consumption and electricity, while kerosene type jet fuel consumption experienced a decrease.

Figure 12: Final Energy Consumption in the Transport Sector, by Energy Source (2000-2005 period compared to 1990)



Transport energy consumption of Bosnia and Herzegovina is mostly realised in road transport, which achieved a share of approximately 98%. Shares of other types of transport are significantly lower, thus the share of railroad transport was 0.5% to 1.9%, while the share of air transport was from 0.7% to 1.5%. Road transport also participated with a very low growth rate of 0.5%. Energy consumption in railroad transport was growing very fast.

4. ENERGY EFFICIENCY POLICIES

4.1. Energy Efficiency Policy

There is, as yet, no Energy Efficiency policy in place. However, the National Environmental Action Plan (NEAP) and the Mid-term Development Strategy (PRSP) emphasise that environmental protection and energy savings are important in the fight against poverty. The NEAP proposes the development of a programme of stabilisation and gradual decrease in the emission of greenhouse gases by improving energy efficiency through technology restructuring, better use of energy sources and increased use of renewable energy sources. Neither the entities nor the State have yet taken concrete steps to develop such programmes and strategies following the NEAP.

The Poverty Reduction Strategy Papers also defines the priorities with respect to energy efficiency. These include:

- (1) the development and implementation of a clear, well designed energy policy and appropriate action plans to encourage energy saving in households and industry;
- (2) to reduce energy consumption; use existing and available technologies such as heat insulation, air recycling, more efficient electric appliances etc.
- (3) as a priority, encourage greater use of public transportation and rationalise use of cars in cities and increase awareness on savings possible through increased energy efficiency.

PRSP also addresses reform of the energy pricing system with prices based on economic criteria and include costs of environmental protection. Also included is the encouragement of renewable and alternative energy sources, research and application of new energy technologies and other technologies increasing energy efficiency.

The recent Energy Sector Study in Bosnia and Herzegovina, among other things, puts an emphasis on the need to set an institutional and legislative framework on the state and entity levels as one of the essential prerequisites for the implementation of energy efficiency measures and the use of renewable energy sources. The Study emphasises that other countries' experiences prove that it is extremely difficult, almost impossible, to set off the use of renewable energy sources and the implementation of energy efficiency measures that require high investment costs without government incentives. It was designed to clearly present the current situation and proposed recommendations and conclusions:

1. Introductory considerations on the importance and ways of implementation of renewable energy sources and energy efficiency measures into Bosnia and Herzegovina's electric power strategy.
2. Energy efficiency principles in the building sector (residential and non-residential sector), transport and industry sectors and specific recommendations for the implementation of energy efficiency measures into the abovementioned sectors.
3. Potentials, obstacles and possibilities of renewable power source usage (biomass, wind, sun, geothermal energy and small-scale hydro plants).

4. Competitiveness analysis of various energy types in households.
5. The effect of the use of energy efficiency measures and renewable energy sources on environment protection and CO₂ reduction.

The Energy Sector Strategy and Energy Efficiency Action plan will define means to achieve the abovementioned recommendations. At present there is no Energy Efficiency Masterplan, Programme or Strategy in Bosnia and Herzegovina at any authority level (state, entity, county). In addition, no detailed feasibility study aiming at developing such documents have been initiated and carried out in the last decade. Only an initial document for energy efficiency is being prepared in Sarajevo Canton.

There is a growing requirement for Bosnia and Herzegovina to address energy efficiency issues through its adoption of the EnC Treaty and Energy Charter. The energy efficiency policy is expected to be an integral part of the Energy strategy now being developed.

By ratifying the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA), Bosnia and Herzegovina has committed to work for its objectives:

- promotion of energy efficiency policies consistent with sustainable development;
- creation of conditions which induce producers and consumers to use energy as economically, efficiently and environmentally soundly as possible;
- fostering of cooperation in the field of energy efficiency.

The Contracting Parties undertake to establish energy efficiency policies and legal and regulatory frameworks which promote, *inter alia*, the efficient functioning of market mechanisms, including market-oriented price formation.

The Energy Community Secretariat established the Task Force on Energy Efficiency in January 2008 in order to produce a detailed plan for tackling energy efficiency issues in the Contracting Parties. Bosnia and Herzegovina is a member of this Task Force. In particular, this should entail the following activities:

- (a) Present a comprehensive state of play of the situation among Contracting Parties and observers in terms of Energy efficiency;
- (b) Identify the concrete areas where improvement is needed and/or feasible, with a proper prioritisation of these areas according to a cost/benefit analysis;
- (c) Identify the EU legislation on energy efficiency that could be extended to the Energy Community and would produce the largest impact. This should include an analysis of the extent to which the Contracting Parties will be able to take up the legislation, possible consequences, as well as a realistic timetable;
- (d) Propose immediate concrete actions (together with a timetable and a budget estimation) allowing the improvement of the energy efficiency in the region. Actions could include exchanges of experiences, training, promotion of concrete measures, institution building;
- (e) Propose concrete measures/indicators to monitor the evolution in terms of energy efficiency.

The Task force has a mandate of 18 months to achieve the mentioned goals.

The main drivers of energy efficiency in Bosnia and Herzegovina are expected to be its obligation *vis-à-vis* its European commitments, opportunities for electricity export, its own competitiveness and the increasing price of energy in the region and the relatively high proportion of family disposable income expended on energy.

4.2. Legal Framework

There are no energy efficiency laws in place at the state or entity level in Bosnia and Herzegovina. Only indirectly is energy efficiency covered in other legislation. Regulators for example have the responsibility of considering both environmental and energy efficiency issues in their tariff making and investment approval regulations and decisions.

4.3. Energy Efficiency Targets

There are no energy efficiency targets in place at the national level. The assumption at this stage is that Bosnia and Herzegovina will aim to comply with EU efficiency targets and will conform to EnC Treaty and applicable EC Directives.

4.4. Energy Efficiency Priorities

As indicated earlier, no policy is in place at present related to energy efficiency. However, we can expect that efficiency related to the residential sector will be critical due to the poor efficiency in the sector at present and its high share of total energy use.

In the power sector, as Bosnia and Herzegovina attempts to develop its export potential, reducing domestic demand can be expected to be a key driver; efficient lighting and product labelling are important areas.

Space heating, again in the household sector, and control of energy consumption associated with district heat are expected to be areas where major improvements can be made.

Energy efficiency and Environmental policy can be expected to be closely linked. The coal mining and power generation sector are significant polluters. Coal mining has a negative environmental impact: soil destruction as a result of opencast mining, land filling of overburden and washing residue from the mines. Opencast mines alone are estimated to cover approximately 12,800 ha and waste from mining operations is estimated to occupy some 6,000 ha. Furthermore, effluent from the washing of coal and other mining operations as well as leaks from dumps are polluting water bodies and threatening groundwater, because effluent treatment plants are virtually non-existent.

Thermal generation plants are the largest polluters in Bosnia and Herzegovina, since much of its pre war industry has been destroyed. The energy sector is at present the country's main air polluter. Typical data shows that the energy sector in Bosnia and Herzegovina emits between 66% and 72% of CO₂ emissions to the atmosphere. Before the war, heavy industry, such as the chemical or steel industry, was a major air polluter.

Many of these factories are today closed, which is why thermal power generation has become the biggest air polluter.

At the same time, the coal and power industries are significant sources of employment while the overall unemployment level is estimated to be above 40%.

Harmonisation of the relevant energy legislation framework of Bosnia and Herzegovina on state and entities levels with EU directives in the area of energy savings, energy efficiency and renewable energy resources is a very complex task requiring an interdisciplinary approach. However, it is an important step of Bosnia and Herzegovina towards the European Union.

4.5. Energy Efficiency Financing

The budgets available for addressing energy efficiency issues are very limited and compete with other critical areas of the economy for scarce funds. The primary source of financing EE investments, for the time being, is regular commercial loans that are considered not favourable by the investors. Interest rates of long-term loans range from 6% to 12%. This fact, coupled with low level awareness and the difficult financial situation of many companies in industry and the services sector rank energy efficiency investments very low in priority.

The Government of FBiH has established The Fund for Environmental Protection, the purpose of which is to finance and support projects reducing emissions and improving the environmental conditions. The Fund is not fully operational. Energy Efficiency and Renewable Energy Supply could be financed through this Fund. It is foreseen that the Fund will be endowed from penalties to pollutants (vehicles, industry, energy plants, etc.). A similar situation, in terms of financing energy efficiency projects exists in Republika Srpska.

The European Commission has directly supported the Energy Sector of Bosnia and Herzegovina in the process of reform through successful realisation of many CARDS (Community Assistance for Reconstruction, Development and Stabilisation) Projects.

Through the new instrument of assistance *IPA*- the Instrument for Pre-Accession Assistance, over the period 2007-2010, the European Commission aims to support Bosnia and Herzegovina to harmonise their legislation with the EU *acquis*, particularly with regards to the energy performance of buildings directive¹ as well as the energy end-use efficiency and energy services² (including renewable energy) directive. In addition, the National IPA focuses on increasing public awareness regarding energy efficiency and the potential for energy savings and the reduction of carbon dioxide emissions.

The IPA 2007 Project aims to address the current legal and policy gap for EE/RE in Bosnia and Herzegovina by combining a top-down approach creating a legal and institutional framework at state and entity level and a bottom-up approach by capacity

¹ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002.

² Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services of 5 April 2006.

building and implementation of EE/RE measures at the local level (within specific municipalities) thus providing models for replication in other municipalities and raising awareness nationwide about the potential for practical implementation of EE/RE measures. Activities for starting the project are in force.

Bosnia and Herzegovina is one of the 12 countries participating in the international UNECE Project Energy Efficiency Investments for Climate Change Mitigation. This project is to promote a self-sustainable investment environment for cost-effective energy efficiency projects and use of renewable energy sources. Through successful implementation of the project Bosnia and Herzegovina will:

- a) Develop the skills of the private and public sectors at the local level to identify, develop and implement energy efficiency and renewable energy investment projects;
- b) Get assistance to municipal authorities and national administrations to introduce economic, institutional and regulatory reforms needed to support these investment projects; and
- c) Get opportunities for banks and commercial companies to invest in these projects through professionally managed investment funds.

Limited funds have been made available through the UNDP and USAID. The UNDP Efficient Housing Programme (2004/2005) aims to introduce low cost methods of saving energy when building or reconstructing buildings, thus mitigating the emissions of greenhouse gases while at the same time reducing the operational costs and increasing the comfort level of the buildings. The project is focused on dissemination of know-how and hands-on experience by training local municipal officials, representatives from housing maintenance companies and homeowner associations in energy efficiency design, principles, management and planning. Based on the training component, 1-3 buildings will be selected and reconstructed according to an energy efficient plan that is to be developed during the practical part of the training. The project will also explore through a feasibility study the potential for using individual small biomass-fired boilers for local wood waste in rural households.

The USAID Municipal Energy Management project (MUNEE) which started in 2002 addressed the lack of a legal and political basis for efficient decision-making and for the delegation of responsibilities for energy and energy efficiency to different levels of government. Knowledge about energy management in the municipalities is scarce. The Alliance to Save Energy (ASE) developed a Municipal Energy Efficiency Committee which brought together representatives from 25 Bosnia and Herzegovina municipalities to train municipal leaders and managers in the basics of energy and water management concepts; development of business plans and strategies for energy efficiency improvements in their municipalities; help municipalities develop and implement energy efficiency pilot projects in schools, hospitals, and water utility companies; help the Alliance understand where legislative changes or clarifications are needed to encourage municipal utilities to achieve full cost-recovery and to provide incentives for municipal buildings to reduce energy expenses; and promote energy efficiency on the municipal level.

The project also addressed District Heating Reform. District Heating Companies in Bosnia and Herzegovina are faced with low collection rates due to the great number of

consumers who do not pay the heating bills. Low levels of payment do not allow for investment in maintenance of or upgrades in the system. A recently adopted Law on Consumer Protection states that the supplied energy is to be paid in accordance with consumption itself rather than by square meter, which is the present case. As a result, the system must be switched to individual heat metering. It is a major priority in terms of better quality of service and better management of district heating system.

The ASE have implemented a pilot project in the residential sector in 2007 and 2008 to demonstrate the savings that can be achieved using low-cost weatherisation techniques in residential buildings with district heating. The project has been co-financed by the municipality in which the project takes place and implemented by the District Heating Company of Sarajevo. The results showed that individual metering and low-cost weatherisation are the easiest ways to achieve strong energy savings, reduce energy bills, improve quality of service and increase collection rates.

4.6. International Cooperation

International cooperation to promote energy efficiency was mentioned in the previous chapter. Bosnia and Herzegovina has no energy strategy or energy efficiency strategy; therefore, the international cooperation in that field is quite poor and it comes down to individual cases.

By signing the Energy Charter Treaty, Energy Community Treaty, as well as by ratifying the Kyoto Protocol, Bosnia and Herzegovina declared its readiness and undertook the obligation to implement the EU Directives in the field of energy efficiency.

International cooperation to promote energy efficiency in different forms is welcome in Bosnia and Herzegovina.

4.7. Energy Efficiency Institutions

As in all aspects of the energy sector, energy efficiency policy is the responsibility of the three Ministries responsible for energy. Implementation of such policies is further devolved to the Cantonal level in the Federation of Bosnia and Herzegovina and the Municipal level in the Republika Srpska.

4.8. Energy Efficiency Monitoring

There is no systematic monitoring of energy efficiency at the present time, other than the operational monitoring of the power utilities by the electricity regulators.

Summary Table III: Energy Efficiency Policies

| Energy efficiency policies | Yes | No | Partly |
|--|----------|----------|----------|
| Has an energy efficiency policy been developed? | | x | - |
| Is energy security a driving force for energy efficiency? | | | x |
| Is climate change/environment a driving force for energy efficiency? | | x | |
| Is sustainable development a driving force for energy efficiency? | | | x |
| Is employment creation a driving force for energy efficiency? | x | | |
| Is industrial competitiveness a driving force for energy efficiency? | x | | |
| Is export of technology a driving force for energy efficiency? | | x | |
| Is comfort perceived as a priority for improving energy efficiency? | | | x |
| Are international obligations a driving force for energy efficiency? | x | | |
| Is there an energy efficiency law? | | x | - |
| Is energy efficiency incorporated in other legislation? | | | x |
| Have national targets been formulated? | | x | |
| Is there a special fund for energy efficiency? | | x | - |
| Is there international cooperation in the field of energy efficiency policies? | | | x |

5. ENERGY EFFICIENCY INSTRUMENTS AND MEASURES

The energy efficiency instruments and measures applied in Bosnia and Herzegovina are limited to the international projects implemented.

There is a programme of energy efficiency “Energy sanitation of Sarajevo”, that was defined for the period 2007-2010 with a project budget of EUR500,000 (financed by District Heating Company Sarajevo) The main aim of this programme is to implement and control some pilot and demonstration projects in the energy efficiency field within residential sector in Sarajevo Canton. Results will be analysed and used for definition of future plans on energy efficiency in Bosnia and Herzegovina.

5.1. Cross-sectoral Instruments and Measures

Table 1: Cross-sectoral Instruments and Measures

| TYPE OF INSTRUMENTS | PROGRAMME DESCRIPTION AND AIMS | IMPLEMENTATION STATUS | BUDGET* | (EXPECTED) RESULTS |
|---------------------|--|-----------------------|-------------|--------------------|
| Financing | EE in residential sector ¹⁾ | Under implementation | 500.000 EUR | |

* Please, provide budget in Euro or USD and specify the currency used.

5.2. Instruments and Measures in the Residential Sector

Table 2: Instruments and Measures in the Residential Sector

| TYPE OF INSTRUMENTS | PROGRAMME DESCRIPTION AND AIMS | IMPLEMENTATION STATUS | BUDGET* | (EXPECTED) RESULTS |
|---------------------|--|-----------------------|-------------|--------------------|
| Financing | EE in residential sector ¹⁾ Programme for Sarajevo Canton only | Under implementation | 500.000 EUR | |

* Please, provide budget in Euro or USD and specify the currency used.

5.3. Instruments and Measures in the Industrial Sector

Currently, there are no instruments and measures for increased energy efficiency and renewable energy use in the industrial sector.

5.4. Instruments and Measures in the Services Sector

Currently, there are no instruments and measures for increased energy efficiency and renewable energy use in the service sector.

5.5. Instruments and Measures in the Transport Sector

Currently, there are no instruments and measures for increased energy efficiency and renewable energy use in the transport sector.

Summary Table IV: Instruments and Measures

| Sectors | Instruments | | | | | |
|-------------|-------------|-----------------|---------------------------|------------------------|-------------------------|-----|
| | Normative | Financial | Information/ awareness | Education/ advisory | Voluntary agreements | R&D |
| Residential | | X ¹⁾ | | | | |
| Industry | | | | | | |
| Services | | | | | | |
| Transport | | | | | | |

1) – Programme for Sarajevo Canton only

6. ACTORS IN ENERGY EFFICIENCY

Currently, there are some private companies (institutions), NGOs, manufacturers and professional associations that are interested in energy efficiency. But, mostly, they exist on paper and don't have crucial experience in energy efficiency. Because of that, their names and titles are not mentioned here, and their analysis was not performed.

Table 3: Intermediary Organisations in the Residential Sector

| RESIDENTIAL SECTOR INTERMEDIARIES | INTEREST IN KEYWORDS | ACTIVE ROLE IN EE (YES/NO) | IF YES, WITH WHICH INSTRUMENTS |
|--|-----------------------------------|----------------------------|--------------------------------|
| EPBiH EP HBHZ EPRS | electricity supply companies | | |
| Gas distributors Sarajevo, Lukavica, Visoko, Zvornik | gas supply companies | | |
| District Heat in Municipalities | District Heating supply companies | | |

Table 4: End-users in the Residential Sector

| RESIDENTIAL SECTOR, END-CONSUMERS | INTEREST | ATTITUDE | ABILITY |
|-----------------------------------|-------------------|---------------------------|---|
| individual houses | limited awareness | interested in lower costs | at present - limited |
| apartments | limited awareness | interested in lower costs | at present – limited district heating is a key target area |

Table 5: Intermediary Organisations in the Industrial Sector

| INDUSTRIAL SECTOR INTERMEDIARIES | INTEREST IN KEYWORDS | ACTIVE ROLE IN EE (YES/NO) | IF YES, WITH WHICH INSTRUMENTS |
|--------------------------------------|----------------------|----------------------------|--------------------------------|
| power generation | | | improved efficiency |
| power distribution companies (EP(s)) | | | reduce losses |
| Gas distribution companies | | | Seasonal / time-of-day options |

Table 6: End-users in the Industrial Sector

| INDUSTRIAL SECTOR, END-CONSUMERS | INTEREST | ATTITUDE | ABILITY |
|----------------------------------|----------|----------------------------|---|
| aluminium industry | | energy cost is significant | considerable investment required |
| metal processing | | interest in EE | considerable investment but with good payback |

Table 7: Intermediary Organisations in the Services Sector

| SERVICES SECTOR INTERMEDIARIES | INTEREST IN KEYWORDS | ACTIVE ROLE IN EE (YES/NO) | IF YES, WITH WHICH INSTRUMENTS |
|--------------------------------------|----------------------|----------------------------|--------------------------------|
| power generation | | | |
| power distribution companies (EP(s)) | | | |
| Gas distribution companies | | | |

Table 8: End-users in the Services Sector

| SERVICES SECTOR END-CONSUMERS | INTEREST | ATTITUDE | ABILITY |
|-------------------------------|----------|----------|---------|
| public buildings | | | |
| commercial buildings | | | |
| hotels | | | |

Table 9: Intermediary Organisations in the Transport Sector

| TRANSPORT SECTOR INTERMEDIARIES | INTEREST IN KEYWORDS | ACTIVE ROLE IN EE (YES/NO) | IF YES, WITH WHICH INSTRUMENTS |
|---------------------------------|----------------------|----------------------------|--------------------------------|
| power distributors | | | |
| petroleum product suppliers | | | |

Table 10: End-users in the Transport Sector

| TRANSPORT SECTOR END-CONSUMERS | INTEREST | ATTITUDE | ABILITY |
|--------------------------------|----------|----------|---------|
| rail | | | |
| commercial vehicles | | | |
| private cars | | | |
| public transport | | | |

7. RENEWABLE ENERGY

7.1. Renewable Energy Potential and Supply

Development of small hydro power plants (HPPs) is the most promising renewable energy source in Bosnia and Herzegovina at the moment. The recent report by EBRD reports on theoretical hydro-potential of 99,256 GWh/year and technical potential of 23,395 GWh/year, of which 2,599 GWh/year is in small HPPs. The potential convenient for construction of small HPPs in Bosnia and Herzegovina amounts to 1004.63 MW or 3519.74 GWh. A significant part of hydro potential suitable for construction of big hydro power plants is permanently lost due to urban, environmental and economic limits. Utilisable potential is estimated to be 13 TWh/year.

Insufficient measurements make it impossible to estimate the real potential for *wind energy* in Bosnia and Herzegovina. A preliminary study carried out by the GTZ has indicated that there is an economic potential for developing approximately 600 MW of wind-based electricity by 2010, assuming that an appropriate incentive system to build wind power installations is introduced. In the period of 1999-2005, preliminary selection of potential locations for installing wind power plants in Bosnia and Herzegovina was performed, with 12 locations marked as having good potential. Total estimated installed capacity for these locations is 720-950 MW, implying annual production of 1440-1950 GWh. The infrastructure offers adequate conditions for connecting possible locations to the grid, as the high- and medium-voltage network is well developed.

The most significant source of biomass for energy production is wood mass from forestry (firewood, forestry residues) and wood waste from the wood processing industry. However, agricultural residues also have a significant energy potential in the regions of northern, central and southern Bosnia and Herzegovina.

Bosnia and Herzegovina belongs to the European countries that receive a significant amount of solar irradiation of around 1240 kWh/m² in the north and reaching 1600 kWh/m² in the south. Bosnia and Herzegovina has on average 1840.9 hours of sun annually, while in the south, this number reaches 2352.5 hours annually. Neum, the only coastal town in Bosnia and Herzegovina, has on average 270 sunny days annually. The total potential of solar energy in Bosnia and Herzegovina is estimated at 67.2 PWh, assuming that 3.6 kWh of radiation energy falls daily on every square meter of horizontal surface. This value exceeds several times the total energy consumption in Bosnia and Herzegovina.

According to the available studies, Bosnia and Herzegovina has a geothermal potential of 9.25 MWt (for heating), and 90,12 MWt (for heating and health centres). Current activities relating to geothermal energy continue to be limited to exploitation for thermal use. For example, a group of buildings in Illidza (a suburb of Sarajevo) is to be heated with geothermal energy. If higher temperatures are discovered in the course of the exploratory drilling, there are also plans for partial conversion to electrical energy. Also, there are plans to attempt to find an investor for one geothermal borehole near Banja Luka.

Very little power and heat is generated from RES (not considering big HPPs), and the share of investments for promoting RES is minimal. With the exception of hydro power and biomass for heating, RES are largely undeveloped.

Utilisation degree of small HPP is 4.4% of the power at disposal, or 5.7% of the energy at disposal, and these degrees of the waterpower potential are at very low level when compared with other European countries, so it is still possible to build quite large number (several hundreds) of small HPPs on BiH's rivers. At present, there are about 25 small HPP with a total capacity of 36 MW and the annual electricity production of 190 GWh; some other plants are under construction (c. 15 small HPP), and large number of small HPP are planned (under a concession procedure). Recently, a strong interest of domestic and foreign investors for the construction of small HPPs in Bosnia and Herzegovina has been evident.

The tradition of *biomass* use in Bosnia and Herzegovina has existed for a long time and it is used mainly in rural and sub-urban areas as the primary source for heating and cooking purposes in households and buildings. Apart from the traditional use of firewood and the recycling of wood waste in the wood-processing industry, there is no reliable data on the exploitation of different biomass sources in Bosnia and Herzegovina.

Currently, there are no wind, solar and PV power plants in Bosnia and Herzegovina (apart from a small PV installation fitted on the roof of an orphanage in Trebinje). The use of solar energy for hot water and heating in the residential sector is insignificant and the exploitation of solar energy with flat-plate collectors is also limited. At this moment, only very small-scale consumers in Bosnia and Herzegovina use it for water heating needs (4.000-6.000 m² solar collectors). The main reasons for that are: the capital costs are still too high (450-550 EUR/m², depending on the type of the system and collectors), and there is no legislation that promotes and subsidises the use of renewable energy systems.

At the present, there are no geothermal power plants in Bosnia and Herzegovina. It must be said, though, that the temperature at the known locations is too low (< 90 °C) for electricity generation, which is why the reserves are currently only under consideration for thermal exploitation. In 2005, a spa owned by the Slovenian Company Terme Catez, started to work in Ilidza near Sarajevo where geothermal energy is used for heating of swimming pools.

7.2. National Policy for Renewables Deployment – Policy Instruments

There are no policy and strategy documents available at this time. They are in preparation and can be expected to be available by the end of 2008.

7.3. Renewables Policy Implementation

The key institutions responsible for policy in Bosnia and Herzegovina are the three Ministries responsible for energy at the state and entity levels. Implementation can be expected to be devolved to the operating companies in the electricity and gas sectors and to the Cantons and Municipalities in the district heating sector.

8. ENERGY AND ENVIRONMENT

8.1. General Trends and Objectives

Bosnia and Herzegovina ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 2000 (Official Gazette Bosnia and Herzegovina 19/2000) and the Kyoto Protocol on 15 July 2007, but this has not still been published in the Official Gazette of Bosnia and Herzegovina. Regarding creation of the Designated National Authority required under Kyoto, it has not been determined yet. The nation-wide action plan for the implementation of the Convention and the first national communication which resulted in a project proposal to GEF/UNDP is in the preparation phase. The implementation agency is UNDP.

Bosnia and Herzegovina is in the phase of preparation of the Memorandum of Understanding (MoU), between the Ministry for Environmental Land and Sea of the Republic of Italia, and the Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina. The subject of this project is: Technical assistance to Bosnia and Herzegovina for the implementation of the Clean Development Mechanism under the Kyoto Protocol.

CO₂ emissions and other greenhouse gas emissions, the share of the residential, industrial, transport and other sectors will be defined through the First National Communication.

8.2. Environmental Policy Implementation

The Ministry of Foreign Trade and Economic Relations (MOFTER) of Bosnia and Herzegovina is responsible for creation of environmental policy at state level. Some early preparatory steps are taken in that regard, but there is no environmental policy at State level in place at this time. It is a priority from the European Partnership, but so far EU funds are not approved.

There are two Ministries at the level of entities with responsibility for environmental issues. In the Federation of Bosnia and Herzegovina it is the Ministry of Tourism and Environment and in Republika Srpska it is the Ministry of Physical Planning, Civil Engineering and Ecology. Environmental Strategies for both entities are adopted.

At the Entity level, as well as the Entity governments other key players are the Cantonal and Municipal Authorities, especially as programmes address the domestic sector.

At the implementation level the key organisations are:

- The three power utility companies currently responsible for generation and distribution: Elektroprivreda BiH, Elektroprivreda RS and Elektroprivreda HZ HB.
- The gas utility companies responsible for transmission and distribution, currently the companies operating in Sarajevo, Lukovica, Visoko and Zvornik.

- The district heating companies operating in the major cities, primarily Sarajevo, Banja Luka, Zenica and Tuzla.

8.3. Environmental Levies and Taxes

There are no specific energy taxes in place, other than PDV (VAT) at 17%.

9. ASSESSMENT AND FUTURE PLANS

9.1. Successful Instruments

A comprehensive modernisation and refurbishment programme has been undertaken at a number of thermal generation plants with international financing. Some of the improvements brought about are:

- The Tuzla power plant has reduced total dust emissions to 20-25% of its pre-war levels, at unit 3 from 800 to 100 mg/Nm³ and at unit 4 to around 70 mg/Nm³;
- It has also cut the NO_x emissions from unit 3 to 400 mg/Nm³ and from unit 4 to some 350 mg/Nm³;
- Dust emissions at the Kakanj power plant have fallen to about 150 mg/Nm³; and
- Emissions are monitored continuously at the major production units.

Generally, the dust and NO_x emission values presented for the rehabilitated units are in line with current EU legislation for large combustion plants (Directive 2001/80/EC). Sulphur emissions have not been tackled so far. The local coal generally has a moderate sulphur content calculated by weight, but total sulphur emissions will nevertheless be substantial as much fuel is required due to its low calorific value and high ash content. Desulphurisation equipment is planned for some generation plants, but funding may not be forthcoming.

Despite its efforts to cut emissions, the power generation sector continues to be the major source of air emissions.

9.2. Barriers

The first barrier to progress in the energy efficiency area is the lack of an overall energy policy for the state and at the entity levels. However, even when this is in place other barriers will emerge, most significant of which is likely to be adequate funding for pursuing energy efficiency policies. Given this, the main drivers for energy efficiency gains are expected to be EU directives and standards.

Also problematic is that no agency exists (Energy Agency) in Bosnia and Herzegovina with a specific mandate to implement and monitor energy efficiency initiatives.

The lack of a legal framework is also a clear barrier and must be addressed urgently.

It is expected that the energy strategy now being developed will address these issues.

9.3. Improvements

Raising the prominence of energy efficiency in the country is certainly seen as one way of making improvements, while at the same time providing economic benefits, especially to the household sector. The EC funded IPA 2007 programme includes a significant component for energy efficiency awareness and education.

Increasing financial resources clearly would help but at present it is not at all clear where these additional funds will come from.

The lack of a legal framework, as indicated above, is a barrier; so the development of local law addressing energy efficiency issues would be a major step forward.

9.4. Recommendations

The recent Energy Sector Study in Bosnia and Herzegovina puts an emphasis on the need to set an institutional and legislative framework on the state and entity levels as one of the essential prerequisites for the implementation of energy efficiency measures and the use of renewable energy sources. The Study also recommends introducing government incentives to set off the use of renewable energy sources and the implementation of energy efficiency measures that require high investment costs.

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**Energy Charter Protocol on Energy Efficiency and
Related Environmental Aspects PEEREA**

Bosnia and Herzegovina

REGULAR REVIEW 2008

Part II(a):

**Indicators on Energy, Energy Efficiency,
Economy and Environment**

Based on National Data

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a. Introduction

This document is Part II of the Review Format of the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA). Part I covers qualitative data on energy and energy efficiency policies, measures and instruments, and actors. This part focuses on quantitative data.

The tables include data relevant to the use of energy. Furthermore information is asked on end-use energy prices and CO₂ emissions.

Conversion of units:

Units are converted to Mtoe using the general conversion factors for energy.

1 Mtoe = 11.63 TWh

1 Mtoe = 4.1868x10⁴ TJ;

1 Mtoe = 107 Gcal

b. Macro-economic Data

Table b.1. Gross Domestic Product

(billion USD 2000)

| | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----------|------|------|-------|-------|-------|-------|-------|-------|
| GDP | | | 4.527 | 4.726 | 4.977 | 5.176 | 5.497 | 5.866 |
| GDP (PPP) | | | 16.62 | 17.76 | 19.05 | 19.92 | 21.4 | 22.84 |

Sources: Energy Sector Study in Bosnia and Herzegovina, IMF

Note: For the war years (1992-1995), there do not exist accurate estimations of the GDP. Up to 1991 BiH had been done calculations on national account to the concept of material production, and local statistical agency makes only calculations for only nominal GDP, because of that we use other sources

Table b.2. Number of Inhabitants

(millions)

| | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|------------|--------|------|-------|-------|-------|-------|-------|-------|
| Population | 4.365* | | 3.781 | 3.798 | 3.828 | 3.832 | 3.843 | 3.844 |

Sources: Foreign Trade Chamber of Bosnia and Herzegovina

* There is no data on population for 1990, only for 1991, source: Republic of Srpska Government

Note: For 1995 there is no data because of war

c. General Energy Data

Table c.1. General Energy Data

(Mtoe)

| Indicators | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|------------------------------------|-------|------|-------|-------|-------|-------|-------|-------|
| Total Primary Energy Production | 6.590 | | 3.454 | 3.611 | 3.518 | 3.919 | 3.963 | 4.074 |
| Net imports | 2.775 | | 1.393 | 1.175 | 1.174 | 1.003 | 1.287 | 1.424 |
| Total Primary Energy Supply (TPES) | 9.382 | | 4.864 | 4.775 | 4.680 | 4.955 | 5.212 | 5.505 |
| Total Final Consumption (TFC) | 5.698 | | 3.263 | 3.286 | 3.148 | 3.301 | 3.529 | 3.818 |
| TPES/GDP (toe/thous.USD) | | | 1.074 | 1.010 | 0.940 | 0.957 | 0.948 | 0.938 |
| TFC/GDP (toe/ thous.USD) | | | 0.721 | 0.695 | 0.633 | 0.638 | 0.642 | 0.651 |
| Total Electricity Consumption* | 0.889 | | 0.667 | 0.693 | 0.688 | 0.741 | 0.780 | 0.831 |
| Electricity produced from RES* | 0.263 | | 0.418 | 0.503 | 0.372 | 0.402 | 0.531 | 0.531 |
| Heat produced from RES** | 1.094 | | 0.936 | 1.026 | 0.926 | 1.073 | 1.028 | 1.129 |

Sources: Energy Sector Study in Bosnia and Herzegovina

* 1 Mtoe = 11.63 TWh

** 1 Mtoe = 4.1868x10⁴ TJ; 1 Mtoe = 10⁷ Gcal

Note: For 1995 there is no data because of war

d. Sector Consumption: Parameters and Energy Efficiency Indicators

Table d.1. Total Final Energy Consumption, by End-use Sector

(ktoe)

| Sectors | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-------------|--------|------|--------|--------|--------|--------|--------|--------|
| Residential | 2049.6 | | 1607.9 | 1704.6 | 1638.6 | 1754.1 | 1737.9 | 1898.6 |
| Industry | 2337.4 | | 664.9 | 607.0 | 571.6 | 566.2 | 715.7 | 822.8 |
| Services | 211.2 | | 193.6 | 202.0 | 209.6 | 209.9 | 217.4 | 233.0 |
| Transport | 775.3 | | 676.0 | 657.8 | 607.3 | 638.5 | 707.2 | 697.2 |
| Agriculture | 136.6 | | 70.3 | 67.2 | 64.7 | 66.9 | 77.2 | 75.3 |
| Others* | 187.9 | | 50.3 | 47.4 | 56.2 | 64.4 | 73.6 | 91.1 |
| Total (TFC) | 5698 | | 3263 | 3286 | 3148 | 3300 | 3529 | 3818 |

Sources: Energy Sector Study in Bosnia and Herzegovina

* Others include Non-specified other sectors and Non-energy use

Note: For 1995 there is no data because of war

**Table d.2. Energy Efficiency Indicators for Households:
Final Consumption of the Residential Sector, by Energy Source**

(ktoe)

| Indicators residential sector | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|--------|------|--------|--------|--------|--------|-----------|-----------|
| Total Final Consumption | 2049.6 | | 1607.9 | 1704.6 | 1638.6 | 1754.1 | 1737.9 | 1898.6 |
| a. Electricity | 274.0 | | 303.8 | 304.4 | 310.9 | 324.0 | 333.1 | 352.9 |
| b. Heat | 528.7 | | 73.4 | 79.6 | 83.6 | 88.3 | 90.1 | 92.5 |
| c. Oil products | 34.4 | | 128.3 | 137.1 | 121.7 | 97.9 | 99.3 | 97.1 |
| d. Gas | 33.1 | | 33.7 | 32.8 | 30.3 | 37.1 | 38.1 | 45.9 |
| e. Coal | 188.4 | | 162.0 | 153.9 | 193.2 | 160.6 | 180.9 | 215.3 |
| f. Combust. Renew. & Waste | 991.0 | | 906.5 | 996.7 | 899.0 | 1046.3 | 996.3 | 1094.8 |
| g. Others | | | | | | | | |
| Floor Area ('000 m ²) | | | | | | | | 97,800.00 |
| No. of dwellings ('000) | | | | | | | 1,067.120 | 1,097.200 |
| Residential use per dwelling (toe/dwelling) | | | | | | | | 1.734 |
| Residential use per surface (toe/m ²) | | | | | | | | 0.0194 |

Sources: Energy Sector Study in Bosnia and Herzegovina

Note: For 1995 there is no data because of war

Table d.3. Final Consumption of the Industry Sector, by Energy Source (2005)

(ktoe)

| Indicators industrial sector | Mining | Manufacturing | | | | | | | Construction | Total |
|--|--------|----------------|--------------------------|--------------------|-----------------------|------------------|-----------------------|-------|--------------|--------|
| | | Iron and steel | Chem. and petro-chemical | Non-ferrous metals | Non-metallic minerals | Food and tobacco | Paper, pulp and print | Other | | |
| Coal | 0.8 | 3.1 | 1.0 | | 68.1 | 7.4 | 44.1 | 21.6 | - | 146.1 |
| Petroleum products | 3.7 | 6.7 | 2.9 | | 9.9 | 25.9 | 7.1 | 29.9 | 30.4 | 116.5 |
| Gas | 0 | 166.5 | 3.7 | | 10.6 | 13 | 0.8 | 3.4 | 0 | 198 |
| Electricity | 3.2 | 230.1 | 7.9 | | 11.3 | 20.1 | 7.7 | 39.2 | 5.0 | 324.5 |
| Heat | - | - | 3.9 | | - | - | - | - | - | 3.9 |
| Combust. Renew. & Waste | - | 1.5 | 0 | | 0 | 0.3 | 0 | 0 | 31.9 | 33.7 |
| Total | 7.70 | 407.9 | 19.40 | | 99.90 | 66.70 | 59.70 | 94.10 | 67.3 | 822.70 |
| Value added per sector (2000 USDx10 ⁶) | | | | | | | | | | |
| Energy/value added (Mtoe/ 10 ⁶ USD) | | | | | | | | | | |

Sources: Energy Sector Study in Bosnia and Herzegovina

Note: In column Iron and steel are data for iron and steel and for non-ferrous metals unified. We do not have those data separated

**Table d.4. Energy Efficiency Indicators for the Services Sector
(Commercial and Non-commercial):
Final Energy Consumption in the Services Sector, by Energy Source**

(ktoe)

| Indicators services sector | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|-------|------|-------|-------|-------|-------|-------|-------|
| Total Final Consumption | 211.2 | | 193.6 | 202.0 | 209.6 | 209.9 | 217.4 | 233.0 |
| a. Electricity | 53.6 | | 120.6 | 127.2 | 130.4 | 138.9 | 142.7 | 150.3 |
| b. Heat | 113.3 | | 16.0 | 17.6 | 18.2 | 18.3 | 19.1 | 19.6 |
| c. Oil products | 6.2 | | 23.9 | 25.7 | 22.5 | 17.8 | 18.3 | 17.5 |
| d. Gas | 4.9 | | 4.3 | 4.5 | 4.3 | 6.5 | 5.4 | 7.6 |
| e. Coal | 33.2 | | 28.6 | 27.2 | 34.1 | 28.3 | 31.9 | 38 |
| f. Combust. Renew. & Waste | | | | | | | | |
| g. Others | | | | | | | | |
| No. of employees (mil.)* | | | 0.301 | 0.290 | 0.289 | 0.287 | 0.295 | 0.301 |
| Floor area ('000 m ²) | | | | | | | | |
| Value added (10 ⁶ USD) | | | | | | | | |
| Energy/value added (Mtoe/10 ⁶ USD) | | | | | | | | |
| toe/Employee | | | 0.643 | 0.698 | 0.725 | 0.732 | 0.738 | 0.774 |
| toe/m ² | | | | | | | | |

Sources: Energy Sector Study in Bosnia and Herzegovina

*Data are from Agency for Statistics of BiH

Note: For 1995 there is no data because of war

Table d.5. Transport Indicators (2005)

| Indicators transport sector | Freight | Travel | Total |
|---|---------|--------|---------|
| Total Final Consumption (Mtoe) | 0.059 | 0.638 | 0.697 |
| 10 ⁹ Tonne-km * | 1.892 | - | 1.892 |
| TFC/10 ⁶ tonne-km | 0.00003 | - | 0.00003 |
| 10 ⁹ Person-km * | - | 1.659 | 1.659 |
| TFC/person-km (TFC/10 ⁶ person-km) | - | 0.0004 | 0.0004 |
| Number of cars/1000 inhabitants | | | 580 |

Sources: Energy Sector Study in Bosnia and Herzegovina

* Agency for Statistics of Bosnia and Herzegovina First Release Transport and Communication, March 2006

Note: For 1995 there is no data because of war

e. End-Use Energy Prices for Various Market Sectors

Table e.1. Energy Prices for End-use Sectors (2005)

(USD per Unit)

| Sectors | Unleaded gasoline 95 RON (litre) | Light fuel oil ('000 litres) | Diesel (litre) | Heavy fuel oil (tonne) | Nat. Gas (10 ⁷ kcal GCV) | Steam Coal (tonne)* | Electricity (KWh)** |
|-----------------------------|----------------------------------|------------------------------|----------------|------------------------|-------------------------------------|---------------------|---------------------|
| Industry | 1.19 | 964.38 | 1.23 | 488.87 | 693.24 | 59.24 | 0.15 |
| Households (Incl. ...% VAT) | 1.19 | 890.20 | 1.23 | 488.87 | 532.22 | 59.24 | 0.09 |
| Electricity generation | - | | | | | | - |

Sources: Energy Sector Study in Bosnia and Herzegovina, FERK, TASED

* Gross Calorific value; in steam coal are average value of brown coal and lignite.

** Prices for electricity are from one Power Company, but they are similar to other two Power companies in BiH

1KM= 0.741833 USD; Source: CBBH

1KWh=860kCal

Note: All data are for 2007

f. CO₂ Emissions

Table f.1. CO₂ Emissions from Fuel Combustion

| Indicators | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|-------|------|--------|--------|--------|--------|--------|--------|
| Total CO ₂ emissions (Mtonnes/year) | 24.5 | | 12.236 | 12.638 | 12.979 | 12.818 | 13.533 | 14.079 |
| Share electricity and heat production (%) | | | 66.42 | 69.54 | 70.49 | 71.63 | 68.47 | 67.37 |
| Share residential sector (%) | | | | | | | | 9.21 |
| Share industrial sector (%)* | | | 9.80 | 8.04 | 7.48 | 6.19 | 8.23 | 9.97 |
| Share transport sector (%) | | | 19.75 | 19.08 | 18.63 | 19.10 | 18.45 | 17.79 |
| Share other sectors (%) | | | | | | | | |
| Total CO ₂ /GDP (kg/USD '95)** | | | 2.703 | 2.674 | 2.608 | 2.476 | 2.462 | 2.400 |
| Total CO ₂ /capita (tonnes/inhabitant) | 5.613 | | 3.236 | 3.328 | 3.391 | 3.345 | 3.521 | 3.663 |
| Total CO ₂ / TFC (tonnes/toe) | 4.300 | | 3.750 | 3.846 | 4.123 | 3.883 | 3.835 | 3.688 |

Sources: Energy Sector Study in Bosnia and Herzegovina

* In column Industrial sector are data for industry and construction unified. We do not have those data separated

** USD 2000

**Energy Charter Protocol on Energy Efficiency and
Related Environmental Aspects PEEREA**

Bosnia and Herzegovina

REGULAR REVIEW 2008

Part II(b):

Indicators on Energy, Energy Efficiency, Economy and Environment

Based on IEA Data

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a. Introduction

This Part II of the Regular Review of the Energy Efficiency Policies of Bosnia and Herzegovina under PEEREA is based on latest available IEA Energy Statistics.

Conversion of units:

Units are converted to Mtoe using the general conversion factors for energy.

1 Mtoe = 11.63 TWh

1 Mtoe = 4.1868x10⁴ TJ;

1 Mtoe = 107 Gcal

b. Macro-Economic Data

Table b.1. Gross Domestic Product

(billion USD 2000)

| | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----------|------|-------|--------|--------|--------|--------|--------|-------|
| GDP | | 1.334 | 4.527 | 4.726 | 4.977 | 5.176 | 5.497 | 6.44 |
| GDP (PPP) | | 7.238 | 20.370 | 21.217 | 22.442 | 23.625 | 25.267 | 25.75 |

Sources: IEA

Table b.2. Number of Inhabitants

(millions)

| | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|------------|------|-------|-------|-------|-------|-------|-------|------|
| Population | | 3.420 | 3.847 | 3.900 | 3.921 | 3.918 | 3.909 | 3.91 |

Sources: IEA

c. General Energy Data

Table c.1. General Energy Data

(Mtoe)

| Indicators | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|
| Total Primary Energy Production | | 0.817 | 2.936 | 2.816 | 3.172 | 3.104 | 3.249 | 3.343 |
| Net imports | | 0.724 | 1.082 | 1.132 | 1.177 | 1.226 | 1.347 | 1.565 |
| Total Primary Energy Supply (TPES) | | 1.541 | 4.018 | 4.364 | 4.171 | 4.447 | 4.704 | 4.963 |
| Total Final Consumption (TFC) | | 1.444 | 2.382 | 2.758 | 2.910 | 2.983 | 3.174 | 3.046 |
| TPES/GDP (toe/thousand USD) | | 1.155 | 0.888 | 0.923 | 0.838 | 0.859 | 0.856 | 0.77 |
| TFC/GDP (toe/ thousand USD) | | 1.082 | 0.526 | 0.584 | 0.585 | 0.576 | 0.577 | 0.47 |
| Total Electricity Consumption* | | 0.310 | 0.504 | 0.529 | 0.577 | 0.603 | 0.617 | 0.660 |
| Electricity produced from RES* | | 0.313 | 0.438 | 0.445 | 0.453 | 0.465 | 0.507 | 0.469 |
| Heat produced from RES** | | - | - | - | - | - | - | 0.182 |

Sources: IEA

* 1 Mtoe = 11.63 TWh

** 1 Mtoe = 4.1868×10^4 TJ; 1 Mtoe = 10^7 Gcal

d. Sector Consumption: Parameters and Energy Efficiency Indicators

Table d.1. Total Final Energy Consumption, by End-use Sector

(ktoe)

| Sectors | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-------------|------|-------|-------|-------|-------|-------|-------|------|
| Residential | | 397 | 576 | 576 | 595 | 598 | 397 | 662 |
| Industry | | 331 | 502 | 679 | 703 | 714 | 331 | 617 |
| Services | | 41 | 86 | 85 | 89 | 93 | 41 | 109 |
| Transport | | 374 | 606 | 632 | 657 | 679 | 374 | 866 |
| Agriculture | | - | - | - | - | - | - | 0 |
| Others* | | 301 | 613 | 785 | 867 | 899 | 301 | 792 |
| Total (TFC) | | 1 444 | 2 382 | 2 758 | 2 910 | 2 983 | 1 444 | 3046 |

Sources: IEA

* Others include Non-specified other sectors and Non-energy use

**Table d.2. Energy Efficiency Indicators for Households:
Final Consumption of the Residential Sector, by Energy Source**

(ktoe)

| Indicators residential sector | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|------|------|------|------|------|------|------|------|
| Total Final Consumption | | 397 | 576 | 576 | 595 | 598 | 612 | 662 |
| a. Electricity | | 218 | 315 | 311 | 325 | 324 | 323 | 351 |
| b. Heat | | - | - | - | - | - | - | |
| c. Oil products | | - | - | - | - | - | - | |
| d. Gas | | 25 | 81 | 85 | 88 | 92 | 107 | 128 |
| e. Coal | | - | - | - | - | - | - | |
| f. Combust. Renew. & Waste | | 155 | 180 | 180 | 182 | 182 | 182 | 182 |
| g. Others | | - | - | - | - | - | - | |
| Floor Area ('000 m ²) | | | | | | | | |
| No. of dwellings ('000) | | | | | | | | |
| Residential use per dwelling (toe/dwelling) | | | | | | | | |
| Residential use per surface (toe/m ²) | | | | | | | | |

Sources: IEA

**Table d.3. Final Consumption of the Industry Sector, by Energy Source
(2005 or latest year available)**

(ktoe)

| Indicators industrial sector | Mining | Manufacturing | | | | | | | Construction | Total |
|--|--------|----------------|-------------------------|--------------------|-----------------------|------------------|----------------------|-------|--------------|-------|
| | | Iron and steel | Chem. and petrochemical | Non-ferrous metals | Non-metallic minerals | Food and tobacco | Paper pulp and print | Other | | |
| Coal | | | | | | | | | | 230 |
| Petroleum products | | | | | | | | | | 113 |
| Gas | | | | | | | | | | 73 |
| Electricity | | | | | | | | | | 200 |
| Heat | | | | | | | | | | |
| Combust. Renew. & Waste | | | | | | | | | | |
| Total | | | | | | | | | | 617 |
| Value added per sector (2000 USDx10 ⁶) | | | | | | | | | | |
| Energy/value added (Mtoe/ 10 ⁶ USD) | | | | | | | | | | |

Sources: IEA

**Table d.4. Energy Efficiency Indicators for the Services Sector
(commercial and non-commercial):
Final Energy Consumption, by Energy Source**

(ktoe)

| Indicators services sector | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|------|------|------|------|------|------|------|------|
| Total Final Consumption | | 41 | 86 | 85 | 89 | 93 | 97 | 109 |
| a. Electricity | | 41 | 86 | 85 | 89 | 93 | 97 | 109 |
| b. Heat | | - | - | - | - | - | - | - |
| c. Oil products | | - | - | - | - | - | - | - |
| d. Gas | | - | - | - | - | - | - | - |
| e. Coal | | - | - | - | - | - | - | - |
| f. Combust. Renew. & Waste | | - | - | - | - | - | - | - |
| g. Others | | - | - | - | - | - | - | - |
| No. of employees (mil.) | | | | | | | | |
| Floor area ('000 m ²) | | | | | | | | |
| Value added (10 ⁶ USD) | | | | | | | | |
| Energy/value added (Mtoe/10 ⁶ USD) | | | | | | | | |
| toe/Employee | | | | | | | | |
| toe/m ² | | | | | | | | |

Sources: IEA

Table d.5. Transport Indicators (2005)

| Indicators transport sector | Freight | Travel | Total |
|---|---------|--------|-------|
| Total Final Consumption (Mtoe) | | | 0.866 |
| 10 ⁹ Tonne-km | | - | |
| TFC/10 ⁶ tonne-km | | - | |
| 10 ⁹ Person-km | - | | |
| TFC/person-km (TFC/10 ⁶ person-km) | - | | |
| Number of cars/1000 inhabitants | | | |

Sources: IEA

e. End-Use Energy Prices for Various Market Sectors

Table e.1. Energy Prices for End-use Sectors (2005)

(USD per Unit)

| Sectors | Unleaded gasoline 95 RON (litre) | Light fuel oil ('000 litres) | Diesel (litre) | Heavy fuel oil (tonne) | Nat. Gas (10 ⁷ kcal GCV*) | Steam Coal (tonne) | Electricity (KWh) |
|-----------------------------|----------------------------------|------------------------------|----------------|------------------------|--------------------------------------|--------------------|-------------------|
| Industry | | | | | | | |
| Households (Incl. ...% VAT) | | | | | | | |
| Electricity generation | - | | | | | | - |

Sources:

* Gross Calorific value

f. CO₂ Emissions

Table f.1. CO₂ Emissions from Fuel Combustion

| Indicators | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|------|-------|-------|-------|-------|-------|-------|-------|
| Total CO ₂ emissions (Mtonnes/year) | | 3.96 | 13.52 | 15.08 | 14.63 | 15.43 | 3.96 | 15.93 |
| Share electricity and heat production (%) | | 21.21 | 60.43 | 55.17 | 51.33 | 52.75 | 21.21 | |
| Share residential sector (%) | | 1.52 | 1.41 | 1.33 | 1.44 | 1.43 | 1.52 | |
| Share industrial sector (%) | | 23.48 | 11.02 | 13.93 | 14.08 | 13.03 | 23.48 | |
| Share transport sector (%) | | 28.28 | 13.31 | 12.47 | 13.33 | 13.16 | 28.28 | |
| Share other sectors (%) | | 24.49 | 13.39 | 16.58 | 18.93 | 18.86 | 24.49 | |
| Total CO ₂ /GDP (kg/USD '95) | | 2.96 | 2.97 | 3.17 | 2.96 | 3.04 | 2.96 | 2.48 |
| Total CO ₂ /capita (tonnes/inhabitant) | | 1.16 | 3.40 | 3.72 | 3.56 | 3.73 | 1.16 | 4.08 |
| Total CO ₂ / TFC (tonnes/toe) | | 2.74 | 5.68 | 5.47 | 5.03 | 5.17 | 2.74 | 5.23 |

Sources: IEA