

# Bosnia Herzegovina

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## 1. Overview of Electricity Supply

Yugoslavia unraveled in 1991 with declarations of independence coming from Slovenia, Croatia, and Bosnia & Herzegovina. In 1992, fighting broke out between Serbs, Croats, and Muslims. The conflict was officially ended in 1995 with the Dayton Peace Agreement, however, international peace-keepers remain in the area.

Nearly all industrial and utility infrastructure was destroyed during the 3 years of fighting. Emergency repairs are actively underway on critical infrastructure, however much of this is still heavily damaged, in particular industrial infrastructure.

Economic activity was slashed to an estimated 10 percent of that previous to the war. However, through the help of international aid and development funds, the economy has recovered significantly, although economic activity is still at around 50 percent of pre-war levels. The economy is still heavily dependent upon these funds as between 20 and 25 percent of economic growth is still attributable to foreign assistance. With the guidance and assistance of international organizations, the government established a central bank in 1997 to regulate monetary policy, and a new currency was introduced, the Convertible Marka (KM). The central bank, along with the KM, that is rigidly pegged to the Deutschmark, has managed to control inflation to single digit levels.

**Bosnia/Herzegovina  
Country Summary Table**

<b>Demographical Information</b>	
Population, millions (2003)	3.8
Land area, thousand Ha (2002)	5,121
<b>Macroeconomic Information (2003)</b>	
GDP, billion US\$	7.1
Real GDP growth rate, percent	3.50
Foreign direct investment (net), million US\$	320
<b>Electricity sector</b>	
Electricity tariff, US¢/kWh (2002)	6.2
Collection rate, percent (2002)	86
Load utilization factor, percent (2000)	NA
<b>Electricity disposition, billion kWh (2003)</b>	
Generation	10.51
Consumption	8.85
Exports	3.20
Imports	2.27
<b>Generation capacity, GW (2003)</b>	
Nuclear	0.0
Thermal	2.0
Hydro	2.0
Other renewables	0.0
<b>Total</b>	<b>4.0</b>
<i>Sources: European Bank for Reconstruction and Development, U.S. Energy Information Administration, Food and Agriculture Organization of the United Nations.</i>	

Existing electric generating infrastructure is entirely composed of thermal and hydroelectric generating stations. Much of the generation and transmission infrastructure was destroyed or severely damaged during the ethnic conflicts.

Additionally, the transmission system sustained significant damage during the war, and is still in the process of rebuilding. The former primary transmission line was a 400 kV network spanning 800 km. This network had two primary interconnections, the Adriatic Line connecting to Croatia, Montenegro, Serbia, and Greece, and the Northeast Line via Ernestinovo in Croatia, which is part of the former central Yugoslavian transmission line. At the present time neither of these interconnections is in operation, however, the system is connected to Croatia, Montenegro, and Serbia via 220 kV lines. A considerable amount of investment in reconstruction is required to bring the entire system back to operational status.

The government has pursued privatization since the end of the war in 1995. Laws on privatization strategy and implementation were passed in 1996, 1997, and 1998, with small-scale privatization beginning in 1999. As of June 2001, about 108 out of 276 small enterprises (value of less than KM 300,000) and about 530 of 1,029 medium to large-scale enterprises were sold to individuals or privatization funds. Formal planning or strategy on privatization is yet to be formulated for the energy industry. Much of the governmental and international focus has been on the repair of damage from the war and the restoration of regular service.

The electricity system in Bosnia and Herzegovina is facing considerable challenges. Large investments are required to rehabilitate, modernize and expand the electricity system to meet growing demand and to maximize trading opportunities. Without these investments, the supply of competitive electricity to the people of Bosnia and Herzegovina will be in danger.

The priority for the electricity industry in Bosnia and Herzegovina is to create efficient market structures within clear regulatory frameworks that encourage more competitive markets for electricity and at the same time are able to attract private investors and ensure economically

sound development of the system. This way, the electricity sector can meet electricity demands as efficiently as possible.

Currently there are three vertically integrated electricity companies in Bosnia and Herzegovina:

- Elektroprivreda of Bosnia and Herzegovina (EPBiH);
- Elektroprivreda Hrvatske Zajednice Herceg-Bosne (EPHZHB); and
- Elektroprivreda of Repulika Srpska (EPRS).

### **Bosnia and Herzegovina – Resources for Energy Production (Source: IEA)**

### **Bosnia and Herzegovina – Transmission System**

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## ***2. Energy Policy, Barriers and Incentives***

Bosnia and Herzegovina is a signatory to:

- Regulation (EC) No 1228/2003 of The European Parliament and of The Council of 26 June 2003 on condition for access to the network for cross-border exchanges in electricity
- Directive 2003/54/EC of the European Parliament and of the Council Concerning Common rules for the internal market in electricity and repealing directive 96/92/EC
- Directive 2001/77/EC of the European Parliament and of the council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market

Currently, Bosnia and Herzegovina is preparing a National report on the state of emissions of greenhouse gases in order to access the Kyoto Protocol.

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## ***3. Wind***

There is not sufficient information to make a statement on the technical potential for wind energy development. No wind turbines operate in Bosnia/Herzegovina. A countrywide wind-atlas is not available. No other projects were identified.

The only neighboring country with some wind energy information available is Croatia. Since the Southwest corner of the country is only some 10 - 20 kilometers away from the Dalmatian Coast, the wind energy resources are likely similar to the resources right across the border. This does not exclude the possibility of finding favorable wind conditions inland, particularly in the northeast.

A country wide wind resource assessment is one of the first priorities to be in place for wind development.

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## **4. Biomass**

Forests and forestland include around 53 percent of Bosnia and Herzegovina's territory or around 2.7 million. hectares. Average annual volume growth of all forests is around 10.5 million m<sup>2</sup>.

Regarding residues from field crops, fruit tree plantations, and livestock activities, there should be a significant potential for their collection and utilization, along with wastes including manures from intensive farms. Utilization of those resources could be done through incineration or anaerobic digestion technologies.

Detailed studies and surveys would have to be carried out to determine location, logistics, size of units, economics and viability, likewise with MSW (Municipal Solid Waste) and the waste of sewage (sewage sludge).

It is assumed that charcoal and wood fuel consumption is similar to that of the remaining inland area of former Yugoslavia.

### Bosnia and Herzegovina Biomass Resource Data

Biomass resource type	Total production	Production density
<b>Percent of total land area covered by</b>		
	54%	
Forests	1%	
Shrublands, savanna, and grasslands	45%	
Cropland and crop/natural vegetation mosaic	0%	
Urban and built-up areas	0%	
Sparse or barren vegetation; snow and ice	0%	
Wetlands and water bodies	54%	
<b>Primary crop production, tonne</b>		
	(avg. 1999-2001, tonne)	(tonne /1000 Ha)
Total primary crops (rank among COO)	3,456,033 (25)	678 (21)
Top 10 primary crops		
Maize	699,776	137
Alfalfa for Forage & Silage	580,000	114
Clover for Forage & Silage	500,000	98
Vegetables Fresh (misc)	450,000	88
Potatoes	346,863	68
Wheat	288,465	57
Cabbages	90,017	18
Maize for Forage & Silage	71,300	14
Oats	57,574	11
Barley	54,681	11
<b>Animal units, number</b>		
	(number)	(number / 1000 Ha)
Cattle	452,232	89
Poultry	3,514,000	689
Pigs	352,500	69
Equivalent animal units	628,372	123
<b>Annual round wood production</b>		
	(1996-98, 000 m <sup>3</sup> )	(m <sup>3</sup> / Ha)
Total	40	7.8
Fuel	NA	NA
Industrial	40	7.8
Wood-based panels	34	6.7
	(1996-98, 000 metric tons)	(metric tons / Ha)
Paper and paperboard	NA	NA
Recovered paper	NA	NA

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## 5. Solar

The situation regarding solar energy is similar to that in other areas of FR Yugoslavia (Slovenia, Croatia, FYR Macedonia), and is among the highest in Europe.

The most favorable areas record a large number of sunshine hours, with the yearly ratio of actual irradiation to the total possible irradiation reaching approximately 50 percent.

The primary form of solar energy and technology used are flat plate collectors for heating houses and some commercial and public premises. But their contribution to the total energy

consumption is insignificant, less than 1 percent. It is not expected that this figure will increase substantially in the near future, as new consumption could mainly come from new entrants to the market i.e. of new buildings or installations.

Due to the high cost of electricity production from solar photovoltaic sources it is likely that the use will initially be limited to research or remote locations, primarily for telecommunications.

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## 6. Geothermal

Subterranean geothermal pools and lakes throughout Bosnia and Herzegovina present potential sources of thermal energy. Before the recent civil war, the first 1 MW pilot plant working on geothermal water was about to be built in Sarajevo. However, due to lack of money the project has not been pursued. Its estimated flow rate is 240 l/s at a temperature of 58°C.

The country's geothermal potential for space heating and therapeutic bath purposes, based on the existing wells, is about 33 MWT.

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## 7. Hydroelectric

Bosnia and Herzegovina's geography includes fast-flowing mountain streams and powerful rivers that are very well suited for hydro-electricity production. Thirteen hydroelectric power stations already exist with a generating capacity of 2,034 megawatts. These are supplemented by four thermal power stations that are being upgraded through an EU grant, which in itself is part of a wider scheme aimed at restoring the national electricity distribution system and in reconnecting the country to the international electric supply grid.

The hydro plants have an average annual generation of 8900 GWh/yr, although actual generation was only 5100GWh in 1998. There is 430MW of capacity in operation at pumped storage plants. No more plants are currently planned. Five existing hydro plants (totaling 1,060MW) are part of multi-purpose developments. There are 13 hydro plants with a capacity greater than 10MW.

Bosnia has an estimated small hydro power potential of 2500GWh/yr. There are ten small, mini or micro hydro plants in operation, with a total capacity of 31MW.

The total hydro power potential of Bosnia and Herzegovina is estimated at 6,100 MW mostly located within the Drina, Neretva and Trebisnjica river basins. Only about 38.75 percent of this is utilized and that amount meets approximately 40 percent of the total electricity production.

According to another estimate, the country's gross theoretical hydro power potential is 68,800GWh/yr (equivalent to 8,000MW), and the technically feasible potential is 24,000GWh/yr (6800MW), and the economically feasible potential is 19,000GWh/yr (5600MW). About 37 percent of the technically feasible potential has been developed so far.

The most urgent task in Bosnia and Herzegovina is to rehabilitate and reconstruct power plants and hydro power structures damaged during the war. The construction of new hydro plants and reservoirs for water supply is also envisioned.

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## ***8. Relevant Links***

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## ***9. References***

- UNDP Finalrep on Geothermal Resources Part II – Replicability Assessment and Strategy
- UN FAO, FAOSTST and CYGNET
- International Water Power and Dam Construction Yearbook 2000, Editor Suzanne Pritchard Wilmington Publishing, U.K.

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## ***10. Country Contacts***

Contacts made in the preparation of this assessment are gratefully thanked for their contribution to this report. Contacts include: