

Serbia

Country Profile

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Note: In June of 2006 Montenegro became an independent state.

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1. Overview of Electricity Supply

There is a need for investment in the electric power system. More than a decade of under-investment and lack of maintenance have left the system operating at the edge of fundamental safety and reliability requirements. Current production levels are unable to meet countrywide demand for power.

Power plant capacity has been deteriorating over the last decade, while household power consumption has been steadily increasing. Transmission and distribution losses are among the highest in Europe.

To meet demand there is a need for new power plants and maintenance on existing production and transmission facilities.

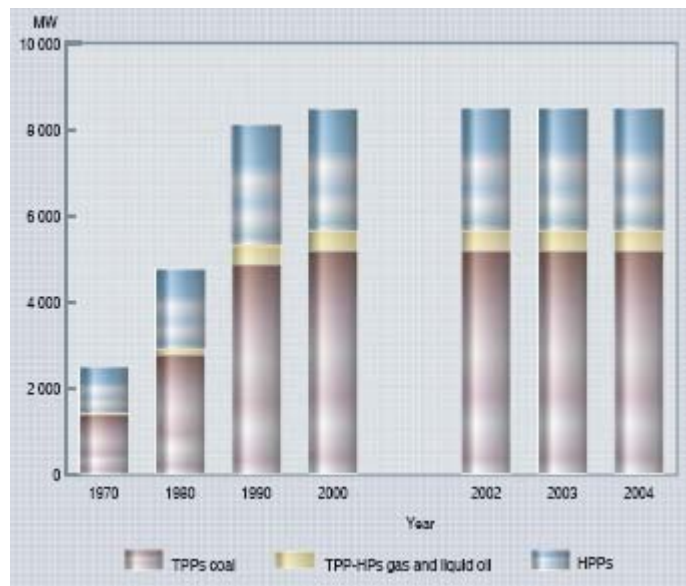
**Serbia/Montenegro
Country Summary Table**

Demographical Information	
Population, millions (2003)	8.3
Land area, thousand Ha (2002)	10,217
Macroeconomic Information (2003)	
GDP, billion US\$	20.4
Real GDP growth rate, percent	2.10
Foreign direct investment (net), million US\$	1,405
Electricity sector	
Electricity tariff, US¢/kWh (2002)	3.6

Collection rate, percent (2002)	84
Load utilization factor, percent (2000)	NA
Electricity disposition, billion kWh (2003)	
Generation	36.04
Consumption	36.62
Exports	0.40
Imports	3.50
Generation capacity, million kWh (2003)	
Nuclear	0.0
Thermal	6.7
Hydro	2.9
Other renewables	0.0
Total	9.6

Sources: European Bank for Reconstruction and Development, U.S. Energy Information Administration, Food and Agriculture Organization of the United Nations.

Net Output Capacity of Power Plants



Source: Electric Power Industry of Serbia



Source: Electric Power Industry of Serbia (EPS)

Potentials for Renewable Energy Sources in Serbia

RES	Present installation / generation	Future potential (annual. Mid-term) additional potential	Costs
Hydropower	2.8 GW / 10.5 TWh	2.0 GW / 7 TWh	600-3000 \$/kW 1-6 c/kWh
LHPPs	2.8 GW / 10.5 TWh	1.5 GW / 5.2 TWh	600-3000 \$/kW 1-6 c/kWh
SHPPs	6 MW / 20 GWh	490 MW / 1.8 TWh	1500-2500 \$/kW 2-5 c/kWh
Bioenergy	11 PJ	75 PJ (thermal) 5 TWh (electric)	3-11 c/kWh
Forestry (incl. wastes)	11 PJ	30 PJ (thermal) 2.0 TWh (electric)	2-8 c/kWh
Energy plants		40 PJ (thermal) 2.5 TWh (electric)	3-8 c/kWh
Biogas		5 PJ (thermal) 0.5 TWh (electric)	4-11 c/kWh
Geothermal energy	79.2 MW (thermal)	15 PJ (thermal)	1-5 c/kWh
Wind energy		50 MW	6-8 c/kWh
Solar thermal		500 TJ (thermal)	6-15 c/kWh
Photovoltaic cells			~ 40 c/kWh
Total		~90 PJ (thermal) ~12 TWh (electric)	

Source: Government of Serbia

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2. Energy Policy, Barriers and Incentives

The Energy Law of July 2004 includes the Energy Sector Development Strategy of the Republic of Serbia. The law shall define the long-term development objectives of specific energy activities, development priorities, sources and methods of providing the required energy quantities, i.e. energy sources, incentives for financial investments in energy facilities using renewable energy sources, incentives for increasing energy efficiency, conditions and methods for ensuring environmental protection and measures for its implementation, as well as other elements vital for the achievement of energy policy objectives.

The generation of electrical power shall include production in hydroelectric power plants, thermal power plants, combined heat and power (CHP) plants and renewable energy or waste electric power plants.

Privileged electrical power producers shall be producers who in their electrical power generation process use renewable energy sources or waste, those who generate electrical power in electric-power plants considered as small electric-power plants within the meaning of this Law, as well as those who simultaneously generate electrical power and heat, provided they meet energy efficiency criteria.

Privileged heat producers shall be producers using renewable energy sources or waste in the heat production process who thus meet the energy efficiency conditions.

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3. Wind

There are no operational wind turbines in FR Yugoslavia.

Due to insufficient data no statement can be made for the technical potential for wind energy development in FR Yugoslavia. Nevertheless, it is thought that there is some potential at least along the Adria coast.

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4. Biomass

Biomass resources represent a significant potential energy source for Serbia. Forests occupy nearly 30,000 km², containing over 300 million m³ of wood biomass. The estimated renewable biomass potential is about 1.8 Mtoe. It is also estimated that the non-commercial biomass share in total primary energy production is about 10 percent. Biomass is used mainly in form of burning wood waste.

Usable energy potential of plant waste derived from agriculture is estimated to be 3.8 Mtoe per year. Animal waste is used for biogas production in biodigestors. Taking into account cattle breeding in FR Yugoslavia, the estimation is that usable energy potential of animal waste is about 0.45 Mtoe per year. Energy potential of industrial and municipal waste in Yugoslavia is estimated to be 1.4 Mtoe per year. Besides heat energy production realized by burning various industrial waste, municipal waste, and especially by burning plant waste, as well as fossil fuel savings, waste use for energy production is very important for the environment.

From the total amount of biomass designated for heating energy, approximately 3.9 million metric tons could be used to save an equivalent amount 1.3 million metric tons of extra light heating oil. The same amount of diesel fuel is consumed in the entire agricultural production process.

Serbia Biomass Resource Data

Biomass resource type	Total production	Production density
Percent of total land area covered by		
Forests	34%	
Shrublands, savanna, and grasslands	0%	
Cropland and crop/natural vegetation mosaic	64%	
Urban and built-up areas	1%	
Sparse or barren vegetation; snow and ice	0%	
Wetlands and water bodies	1%	

Primary crop production, tonne	(avg. 1999-2001, tonne)	(tonne /1000 Ha)
Total primary crops (rank among COO)	21,380,329 (11)	2,096 (11)
Top 10 primary crops		
Maize	4,978,667	488
Alfalfa for Forage & Silage	4,747,000	465
Clover for Forage & Silage	2,476,000	243
Wheat	2,346,667	230
Sugar Beets	1,999,204	196
Potatoes	748,631	73
Maize for Forage & Silage	527,000	52
Plums	373,333	37
Sunflower Seed	315,333	31
Grapes	312,752	31
Animal units, number	(number)	(number / 1000 Ha)
Cattle	1,641,500	161
Poultry	23,805,000	2,334
Pigs	4,229,500	415
Equivalent animal units	3,571,350	350
Annual roundwood production	(1996-98, 000 m ³)	(m ³ / Ha)
Total	1320	129.4
Fuel	50	4.9
Industrial	1270	124.5
Wood-based panels	132	12.9
	(1996-98, 000 metric tons)	(metric tons / Ha)
Paper and paperboard	148	14.5
Recovered paper	25	2.5

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5. Solar

As in the case of other countries in the area, solar levels in the former Yugoslavia including Serbia and Montenegro are among the highest in Europe. The most favorable areas record a large number of hours of sunlight, with the yearly ratio of actual irradiation to the total possible irradiation reaching approximately 50 percent. Of course, the monthly distribution is particularly important in determining utilization for heating; and whether back-up systems will be needed during periods of extended cloudiness.

In 1998 annual sales of solar flat plate collectors was around 250,000 m². Some 28,000 solar thermal units were in operation, replacing the equivalent of 140 GWh of fossil fuel derived energy being used mainly for water and space heating in the domestic and tourist sectors.

The total potential for solar active technologies has been estimated to be approximately 50-60 percent of heating demand in the cloudier central regions. The in-country manufacturing base for the whole of FR Yugoslavia was reported as being strong, with about nine firms in production. But the majority were operating at less than one fifth capacity. And it is not known how many survived the recent crisis. The available expertise, however, indicates that as the economy recovers, it would be easy to accommodate growing demand.

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6. Geothermal

Geothermal investigations in Serbia began in 1974, after the first world oil crisis. An assessment of geothermal resources has been made for all of Serbia. Detailed investigations in twenty localities are in progress. The territory of Serbia has favorable geothermal characteristics.

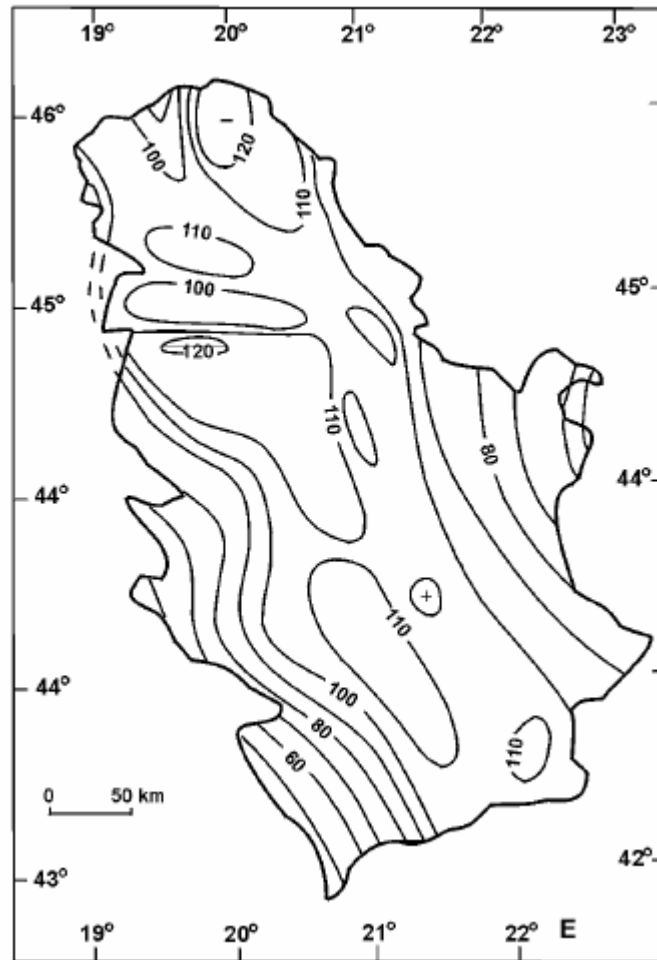
There are four geothermal provinces. The most promising are the Pannonian and Neogen magmatic activation provinces. More than eighty low enthalphy hydrogeothermal systems are present in Serbia. The most important are located at the southern edge of the Pannonian Basin. The reservoirs of this systems are in karstified Mesozoic limestones with a thickness of more than 500 m. Geothermal energy in Serbia is being utilized for balneological purposes, in agriculture and for space heating with heat exchangers and heat pumps.

Exploration to date has shown that geothermal energy use in Serbia for power generation can provide a significant component of the national energy balance. The prospective geothermal reserves in the reservoirs of the geothermal systems amount to 400×10^6 tonnes of thermal-equivalent oil. The prospects for use of heat pumps on pumped ground water from alluvial deposits along major rivers are very good.

For intensive use of thermal waters in agro- and aqua-cultures and in district heating systems, the most promising areas are west of Belgrade westward to the Drina, i.e. Posavina, Srem, and Macva. Reservoirs are Triassic limestones and dolomites >500 m thick, which lie under Neogene sediments. The priority region is Macva, where reservoir depths are 400-600 m, and water temperatures are 80 °C.

The economic blockade of Serbia stopped a large project in Macva: space-heating for flower and vegetable green-houses over 25 ha (1st stage). The completed studies indicate that thermal water exploitation in Macva can provide district heating systems for Bogatic, Sabac, Sremska Mitrovica, and Loznica, with a population of 150,000.

In addition to the favorable conditions for geothermal direct use from hydrogeothermal reservoirs in Serbia, geothermal use can also be made of hot dry rocks, as there are ten identified Neogene granitoid intrusions. Geothermal exploitation program have been prepared, but they have not been brought into operation.



Heat flow map (mW/m^2) of Serbia

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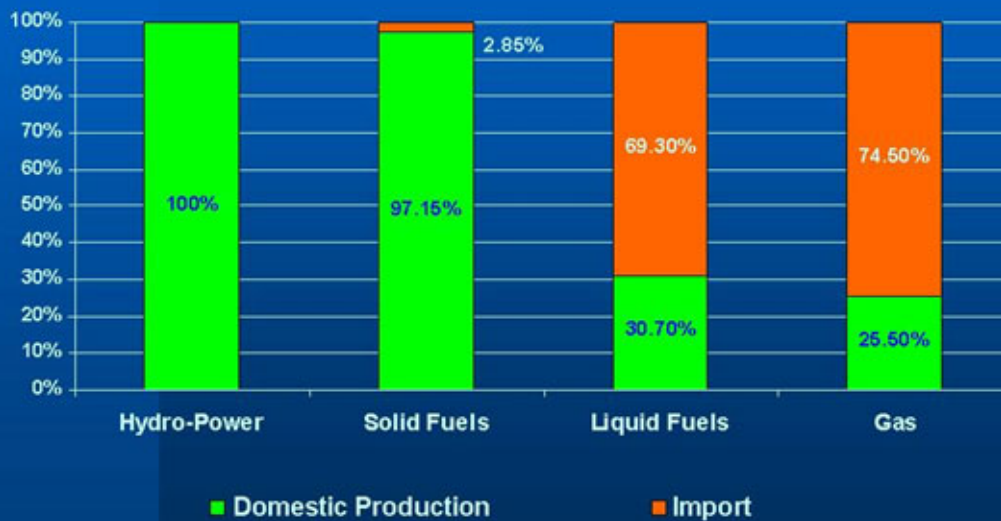
7. Hydroelectric

The total hydro-power potential of Serbia amounts to about 25 billion kWh a year. The amount of about 17.5 billion kWh a year is classified as a technically and economically usable potential, of which about 10.3 billion kWh is utilized.

Hydropower contributed 36 percent to electricity generation, the remainder originates from thermal power plants (on the basis of lignite) and some smaller amounts of CHP (1.4 percent of gross electricity generation in 2001, which is well below the European Union average of 9 percent).

There are nine hydro-power plants (HPPs) within the power system of Serbia, with fifty hydro-units of the total capacity of 2,831 MW, producing on average 12 billion kWh a year. The total power content of the seasonal reservoirs is about 1,2 billion kWh.

Energy Supply in Serbia



Source: Government of Serbia

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8. Relevant Links

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9. References

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- NV Consultants

- Government of Serbia, Official Statistics
- Mihailo Milivojevic and Mica Martinovic, Geothermal Energy Possibilities, Exploration And Future Prospects In Serbia, June 2000.

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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: