

Romania

Country Profile

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1. Overview of Electricity Supply

Electricity generation in Romania is primarily from thermal power plants (coal, natural gas, and oil), with the balance of production from hydroelectric facilities and a recently commissioned nuclear power plant.

Romania's economy is currently in transition from a 'command' economy to a market driven economy. At present, the energy sector is characterized by:

- Co-generation plants for urban heating
- Extensive use of coal-fired installations for power and heating generation systems
- Use of hydroelectric power plants and potential for strong development in this sector
- Nuclear energy provision from the Romanian/Canadian Cernavoda plant

The energy sector in Romania is supervised currently by the Ministry of Industry and Trade. The National Electricity Company, CONEL is responsible for electricity transmission, and is also the system and market operator.

The whole economic and technical operation and development of the electricity sector is regulated, ruled, supervised and monitored by the National Electricity and Heat Regulatory Authority (ANRE), set up by an Emergency Ordinance in October 1998 as a public institution, independent and autonomous.

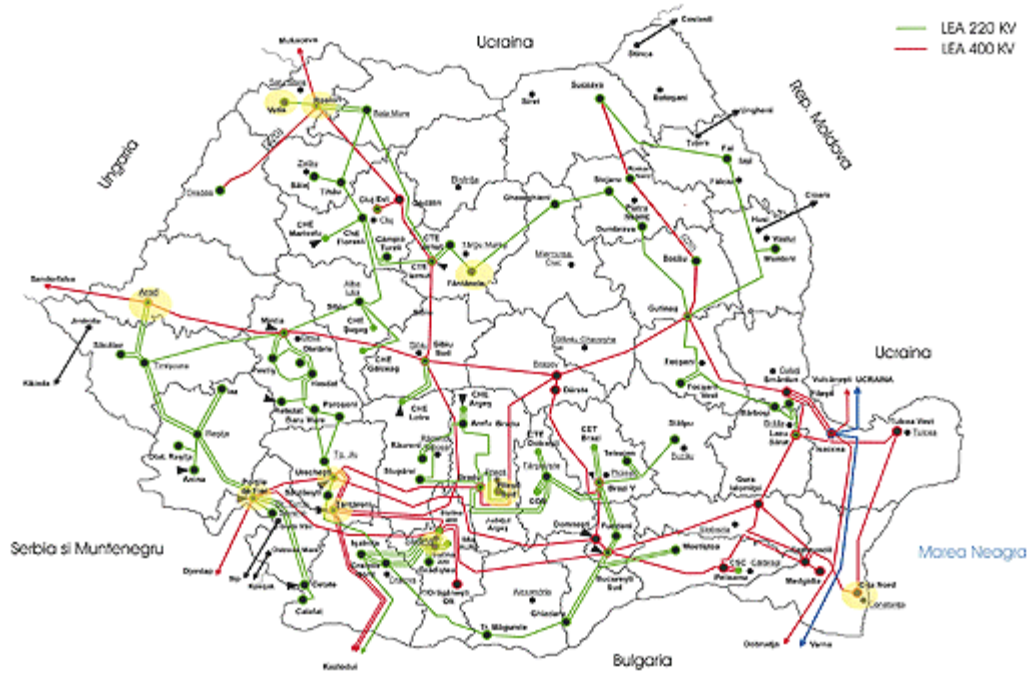
Although the government still owns a large portion of industrial assets, privatization of the energy sector has begun, and major upgrades to the energy sector are planned over the next ten years.

In the 2002 regular report on Romania's progress towards accession to the EU, the EU commission came to the conclusion that Romania does not devote the necessary resources to improving energy efficiency and promoting renewable energy. Efficiency of energy production and transportation networks is poor due to lack of maintenance and investment.

After years of delay, the government is moving quickly to privatize the state-owned power and gas assets in an effort to meet loan conditions set by the International Monetary Fund (IMF). In 2004, the government made substantive progress in fulfilling IMF loan conditions by selling stakes in regional gas and power distribution companies. Romania is also striving to bring its utility sectors in line with European Union (EU) standards, with market liberalization under way to open the door for competition, price reform and Romania's expected accession to the EU in 2007.

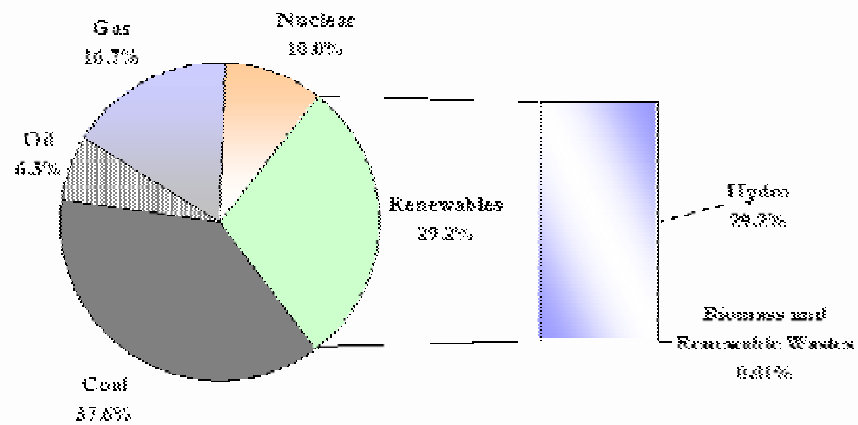
Romania
Country Summary Table

Demographical Information	
Population, millions (2003)	21.7
Land area, thousand Ha (2002)	23,839
Macroeconomic Information (2003)	
GDP, billion US\$	57.3
Real GDP growth rate, percent	4.90
Foreign direct investment (net), million US\$	2,156
Electricity sector	
Electricity tariff, US¢/kWh (2002)	7.0
Collection rate, percent (2002)	96
Load utilization factor, percent (2000)	NA
Electricity disposition, billion kWh (2003)	
Generation	51.70
Consumption	45.16
Exports	3.30
Imports	0.38
Generation capacity, GW (2003)	
Nuclear	0.7
Thermal	14.7
Hydro	6.1
Other renewables	0.0
Total	21.6
<i>Sources: European Bank for Reconstruction and Development, U.S. Energy Information Administration, Food and Agriculture Organization of the United Nations.</i>	



Electricity Map of Romania

Romania - Electricity Generation by Fuel 2002



Source: ICA Energy Services - Copyright © 2002
 Figures by Statistica (http://www.statistica.ro) for both OECD countries and over 100 other countries is available through the EIC website.
 http://www.eneraffairs.com/statistica.asp

Breakdown of Generation Capacity

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2. Energy Policy, Barriers and Incentives

Currently, a minor amount of renewable energy besides hydropower has made its way into Romania's electricity generation mix. Biomass and waste incineration have been in use in Romania for many years, though not in any significant-sized generating facility. The Romanian government is planning to implement a new program for increasing the use of renewable energy that includes photovoltaic, wind energy, biomass, and geothermal energy.

The promotion of electricity produced from renewable energy sources in the internal electricity market is underlined in the provisions of the GO 63/1998 regarding the electricity and heat and also in the provisions of the new Electricity Law no. 318/2003. Therefore in chapter V of Law 318/2003 named "Renewable energy sources" definitions, technical utilization and marketing conditions and facilities are announced:

- Art. 51.: Based on this Law, the competent authority (ANRE) will regulate the technical conditions for access to the electrical network and the technical conditions for marketing the electricity and heat produced in cogeneration from renewable sources.
- Art. 52.: Based on technical and economical studies, the development and utilization of renewable energy sources are stimulated, the facilities being granted by Government decision as a result of a proposal made by the competent authority (ANRE). The promotion of renewable energy resources it is also provided by the Energy Efficiency Law no. 199/2000.

In Romania, an indirect stimulating mechanism for utilization of renewable energy sources is regulated but the schemes for direct subvention of prices for which the producers of electricity from renewable sources are selling their product are lacking.

Therefore the Order no. 92/2002 regarding the application of Competition Council regulations, issued on the base of Law no. 143/1999 regarding the state support" adopted the "Regulation regarding the state support for environmental protection".

In chapter 3 of this act the general conditions for authorization of state support for investments in environmental protection are provided:

"Investments for promoting the renewable energy sources are assimilated to the environmental protection investments achieved as a result of lacking compulsory national standards. The measures aimed to support the renewable energy sources represent one of the long-term targets that have to be especially encouraged. The base rate of support for investments made for this energy form represents 40 percent from the eligible costs. In the case of production capacities of energy from renewable sources that cover entirely the energy consumption of a community, the investments made can get a bonus of 10 percent over the base rate of 40 percent from the eligible costs. When the needful character of the investments is proved the supplying authority can support the investments for producing energy from renewable sources to up to 100 percent from the eligible costs. The respective installations will no longer benefit from other type of support."

"In the case of renewable energy sources the eligible costs of investment are usually the additional costs taken by the economic body in comparison with a conventional energy installation with the same energy production capacity."

The state support for renewable energy sources can be granted according to the following options:

- when the investments costs are very high and, generally, the state support represents a significant percentage from the economic bodies costs that cannot allow obtaining competitive prices on the market for the produced energy;
- support for renewable energy can be granted by using the market mechanisms as ecological certificates;
- support for operation can be granted for new installation for producing energy from renewable sources, its value being calculated based on external costs that are avoided.

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3. Wind

Romania is considered to have the highest wind energy potential in the region. Its wind resources are well-documented, and there are a broad range of existing applications from small autonomous units for rural areas to large off-shore potential. There is no current installed capacity, but the government has a target of 200 MW by 2010.

A country wide wind-atlas, prepared by the Energy Research and Modernizing Institute (ICEMENERG SA) in 1993, is based on WA^{SP} software and meteorological data deserved during the period 1980-1990. The Romanian wind atlas indicates wind speeds of 4.5 to 11.5 m/s at 50 m height in various areas of the country, notably off-shore.

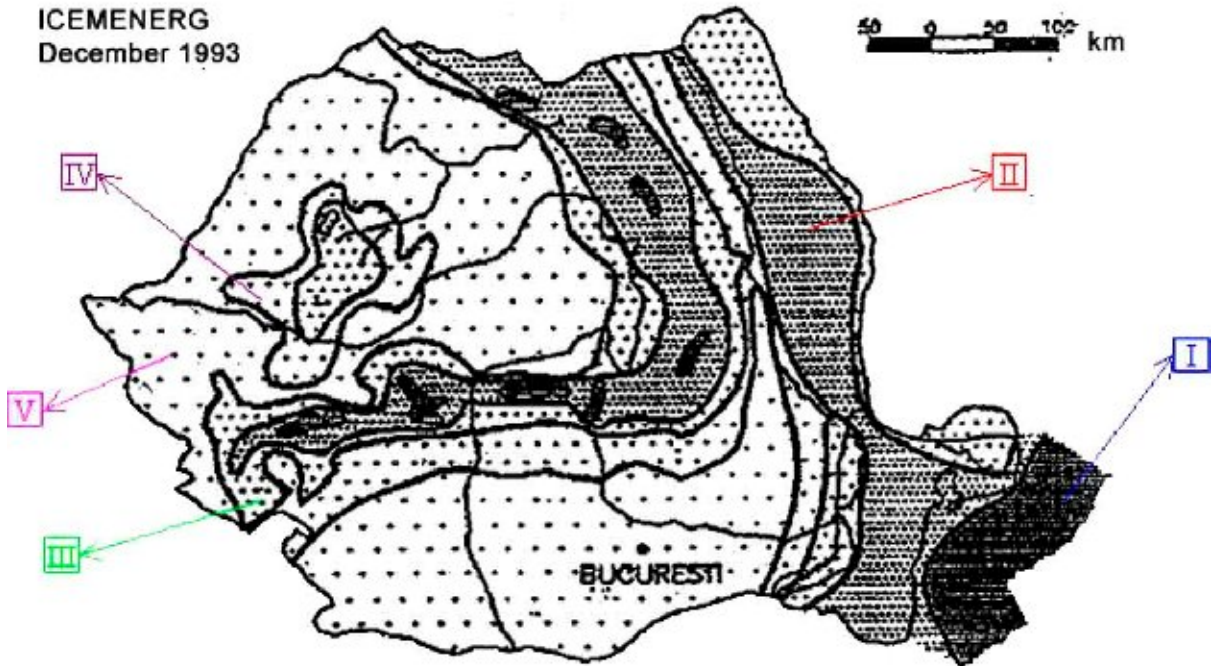
The Romanian Wind Energy Association is active in the country, and additionally ICEMENERG is the leading wind energy institute of the country with state of the art capabilities.

One current project of 24.5 MW, consisting of 22 each 750 kW and 4 each 2 MW turbines, was identified. The project at Constanta at the Black Sea coast is being developed by ABB and is in the stage of "investment approval". The average wind speed at hub-height is 6.2 m/s.

Based on the available wind atlas Romania has a very good technical potential for wind energy development.

The wind atlas developed by ICEMENERG identifies huge areas with wind speeds over 11 m/s depending on topography. Highest measured wind speed is at Calimani at an altitude of 2022 m, with annual average of 10.3 m/s at 10 m above ground.

ICEMENERG
December 1993



Wind Potential	A high mountains	B open sea	C sea coast	D open plain	E hills
I	>11.5	>9	>8.5	>7.5	>5
II	10-11.5	8-9	7-8.5	6.5-7.5	5-6
III	8.5-10	7-8	6-7	5.5-6.5	4.5-5
IV	7-8.5	5.5-7	5-6	4.5-5.5	3.5-4.5
V	<7	<5.5	<5	<4.5	<3.5

Wind atlas of Romania

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4. Biomass

Biomass is currently used only for heating purposes. In year 1998 the production of biomass reached 126 PJ and contributed 11 percent to the total energy of the country. In 1999, the biomass production was of 118 PJ. The potential market for biomass applications is very large but specific incentives will be needed in the order for this potential to be realized.

Direct burning in the kilns, stoves for space heating, cooking and hot water preparation is about 95 percent of the biomass use. These furnaces have a nominal capacity between 0.8 kW to 4 kW and are hand stocked and with an average efficiency between 15 to 50 percent.

Burning in thermal plants to generate industrial steam and hot water in sawmills and in other industries equals about 5 percent of biomass usage. In sawmills, the average installed capacity is 3.3 MW and in other in other industries 4.7 MW.

The main Romanian legislation concerning environmental aspects and biomass utilization: Law no. 137/1995 on environment protection, Law no. 107/1996 on water protection, Forestry Code approved by Law no. 26/1996 Ordinance Ministry of Waters, Forests and Environment Protection. no. 462/1993 on evaluation of pollutant emission, Ordinance Ministry of Waters, Forests and Environment Protection. no. 125/1996 on regulation procedure for economical and social activities having environmental impact.

The biomass sector in Romania is characterized by a twofold regional distribution; about 90 percent of fuel wood and 55 percent of wood waste is found in the Carpathians and Subcarpathians. About 54 percent of agricultural wastes are found in the South Plain and Moldavia. About 52 percent of biogas is found in the South Plain and the Western Plains.

Large amounts of small-sized wood is obtained in wood industry, but utilization of this wood for energy purposes is insufficient due to difficulties related to gathering, processing and transportation. Studies show that these wood wastes are economically viable resources.

Romania Biomass Resource Data

Biomass resource type	Total production	Production density
Percent of total land area covered by		
Forests	28%	
Shrublands, savanna, and grasslands	1%	
Cropland and crop/natural vegetation mosaic	69%	
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)	53,291,420 (6)	2,314 (10)
Top 10 primary crops		
Alfalfa for Forage & Silage	7,846,000	341
Maize	7,777,600	338
Leguminous (misc), Forage & Silage	6,316,667	274
Wheat	5,364,014	233
Grasses (misc), Forage & Silage	4,678,167	203
Potatoes	3,742,300	162
Mixed Grasses, Legumes	2,949,367	128
Clover for Forage & Silage	2,704,367	117
Vegetables and Roots, Fodder	1,244,867	54
Grapes	1,170,786	51
Animal units, number	(number)	(number / 1000 Ha)
Cattle	3,097,000	134
Poultry	69,312,000	3,009
Pigs	6,521,000	283
Equivalent animal units	6,398,520	278
Annual roundwood production	(1996-98, 000 m ³)	(m ³ / Ha)
Total	12476	541.6
Fuel	3174	137.8
Industrial	9302	403.8
Wood-based panels	390	16.9
	(1996-98, 000 metric	(metric tons / Ha)

	tons)	
Paper and paperboard	310	13.5
Recovered paper	92	4.0

There are good opportunities for biomass development in Romania.

Biomass applications for biomass can be grouped into the following main market segments:

- substitution of part of the fossil fuels in existing district heating schemes (wood chips)
- enhanced uses of biomass as industrial fuels (wood chips and logs as industrial fuel for steam or hot water boilers) instead of oil
- improved uses of biomass for new district heating schemes for small towns and villages near the resources, in the countryside, where the population has no access to central co-generation or gas supply
- uses of straw and other agricultural by-products in appropriate biomass boilers for heat supply of farms and small villages (in the medium term)
- The top priority is the use of biomass for thermal applications, substituting oil. Assuming an available biomass energy supply, district heating systems represent the most immediate and low-cost biomass application in Romania especially CHP plants, industrial co-generation and co-firing.
- The most promising regions for the agricultural waste utilization could be the South Plain, especially the counties Braila, Ialomita, Calarasi, Giurgiu, Teleorman and the West Plain, especially the counties of Arad and Timisoara. In these counties the agricultural production is high, there are no own sources of fuel for heating and cooking.
- In the Carpathians Mountains and Subcarpathians area where firewood and wood waste are available, there are opportunities to develop district-heating plants. The size of boilers for the district heating in the identified projects range from about 1 MW_{th} to 6 MW_{th}. (1996 RES Strategy)
- The expected development of the wood industries will encourage the rehabilitation of the existing boilers from the existing auto producer's thermal plants which account about 550 steam boilers, or the construction of the new ones. The existing auto producer's thermal plants account about 550 steam boilers. (Balkan OPET)

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5. Solar

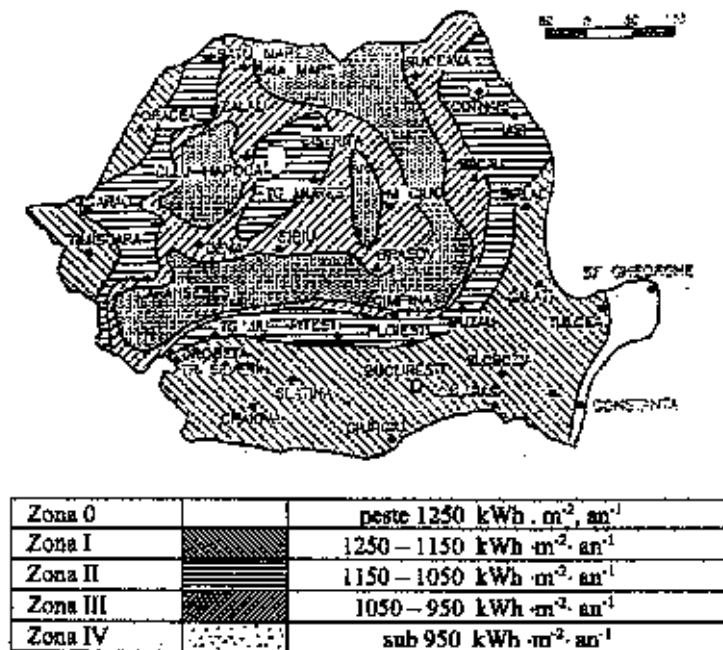
Romania has exploited a significant amount of solar resources in the past, but since 1990, the manufacturing, installation and research and development has virtually ceased. The potential market for solar applications is very large but specific incentives will be needed in order for this potential to be realized.

In Romania, starting from 1979, a large scale program for various solar applications was implemented; solar domestic hot water systems for hotels at the Black Sea and for apartment blocks, solar house near Bucharest, solar drying for agricultural products in the South Plain, solar cooling for fish preservation in Dobrogea region, industrial applications. A lot of efforts have been made in R+D activities and an important human potential and infrastructure were available. The peak of installations occurred in 1984-85.

The poor quality of the equipment and installation made in Romania and the lack of maintenance in many of the early installations resulted in a deep dissatisfaction, creating an additional barrier to further solar energy utilization. The manufacturing, installation and R+D activities have practically stopped since 1990 because of the market reforming and the resulting difficult economic situation.

The average solar radiation in Romania ranges from 1.100 to 1.300 kWh/m² per year for more than half of the country surface. (Energetica no 6, June 1999)

The solar radiation map for Romania, relayed on average multi-years data from the National Institute of Meteorology and Hydrology, is presented below.



The Romanian Solar Radiation Map (Energetica no 6, June 1999)

Romanian Areas/Projects with High Potential for Solar Energy

Area	Size [MJ/m ² /year]
Black Sea coast	5.384
South plain	5.147
Danube Delta	5.046

Western plain 4.815

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6. Geothermal

The exploration and research for geothermal resources began in Romania in 1962, and over 200 wells have been drilled, proving the existence of low enthalpy geothermal resources with temperature of 40-120 °C. At present about 137 MWt are used from about 61 active wells producing hot water in the temperature range of 55-115 °C.

Romania has the third highest geothermal potential of European nations, with major potential locations on the Western Plain, South Plains in the region of Bucharest, and in the Carpathian regions.

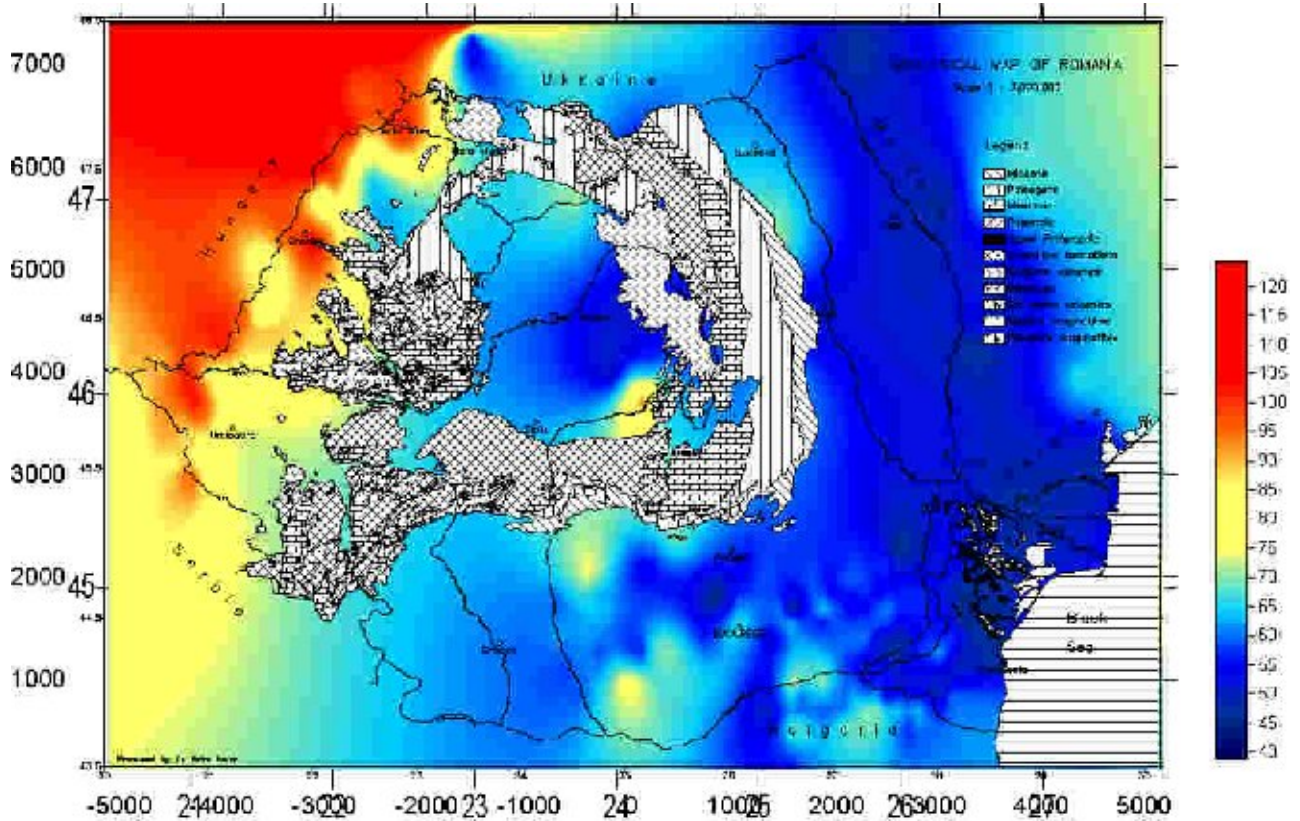
Romania's highest enthalpy geothermal resource of 3,000 °C was identified at Tusnad-Bai. Five sites have a temperature over 100 °C.

The main technical potential areas include:

- Western Plain with 4,300 TJ/year potential energy production
- Southern Carpathians (at the contact with the Getical Subcarpathians) with 270 TJ/year potential energy production
- South Plains with 720 TJ/year potential energy production

At present only about 137 MWt are used from about 60 wells, producing hot water in the range 55-115 °C. High enthalpy prospects are identified in Sanandrei in the Western Plain (130 °C) and in Tusnad in the Eastern Carpathians (200 °C).

Geothermal Resource Map



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7. Hydroelectric

The installed capacity of hydropower is 6,120 MW, representing nearly 30 percent of Romania's total installed electricity generating capacity. The country's hydropower potential is extremely large, with an estimated additional potential of over 9 GW. Lack of funding is the greatest barrier to increasing current capacity.

The total theoretical hydroelectric potential of Romania, given optimum technological conditions--has been calculated at some 70 billion kilowatt-hours in an average year, but for technical and economic reasons only a fraction of this potential has been developed. Geographically, the hydroelectric reserves of Romania are concentrated along the Danube and in the valleys of rivers emerging from the mountain core of the country. Other hydrographic resources include the more than 2,500 lakes, ranging from the glacial lakes of the mountains to those of the plains and the marshes of the Danube delta region. The main effort since the 1940s, however, has been on the Arges, Bistrita, Lotru, Olt, Mare, Sebes, and Somes rivers as well as on the Danube at the Iron Gate.

The Romanian government has encouraged foreign investment in hydropower through Hydroelectrica, the state-owned hydropower producer. In Romania there are 362 Hydroelectric Power Plants (HPP) with an overall installed capacity of 6,120 MW, which means 27.9 percent of the overall installed capacity of the Romanian power system.

Out of these 362 hydroelectric power plants there are:

- 317 HPPs with capacities between 0 and 30 MW, totalizing 1069 MW installed
- 32 HPPs with capacities between 30 and 100 MW, totalizing 1529 MW installed
- 13 HPPs with capacities over 100MW, totalizing 3552 MW installed
- In 2000, the total energy produced by the hydro sector was 14778 GWh, representing 28.5 percent of the total energy produced in Romania.

In Romania, the most important water basins are: Olt, Lotru, Bistrita, Somes, Dragan, Arges, Dambovita, Raul Targului, Sebes, Raul Mare, Cerna, Bistra, Buzau, Motru, and Danube.

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8. Relevant Links

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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: