

Moldova

Country Profile

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1. Overview of Electricity Supply

Moldova has seen significant difficulties since it received independence in the early 1990's. The GDP has consistently shrunk throughout the 1990's while inflation reached an annual rate of over 1,000% for a period. Additionally, political conflicts have caused serious problems to the energy sector and the government.

Electricity generation is made up with a majority of thermal (coal and gas) plants with the balance in CHP plants providing district heating, and a small amount of hydroelectric generation. The generation assets are in serious need of rehabilitation and modernization as they have deteriorated over the past decade. The problem has been exacerbated from unpaid consumer electric bills for electricity and district heating. Most consumers cannot afford to pay for normal energy services.

Moldova is dependent on imported energy resources from the Russian Federation, Ukraine (gas, coal, oil) and Romania (electric energy). Moldova is a net importer of energy, with less than 5 percent of primary energy demand covered by domestic sources. Hence, the use of renewable energy is very interesting and highly prioritized.

The majority of the population of 4.3 million lives in rural communities, where living conditions are especially difficult in the cold winter months. Traditionally, coal and wood are used as a heating fuel in rural areas. After the collapse of the Soviet Union the price of fuels, including coal, increased dramatically. Total annual coal consumption dropped in the following decade, from 2,500,000 to 50,000 tons, an indication of latent demand. Coal supplies to fuel heating systems in public buildings, especially in rural communities, were severely cut-back, often resulting in the closure of public buildings in the winter period. District heating plants stopped operating except in the biggest cities.

In 1997, Moldova began restructuring and privatizing its power sector. The state-owned electric utility, Moldenergo, was separated into 16 autonomous units performing separate functions in power generation, transmission, or distribution. These units still remained in government hands after the restructuring.

In April 2001, the Moldova government passed laws to permit utilities to cut service to non-paying customers; the non-payment problem has been a contributing factor in the poor financial condition of Moldova's utilities. Another contributing factor has been the government-set tariffs at below cost-recovery levels.

The current transmission grid in Moldova needs updating. In eastern Moldova most of the transmission lines are 110 kV. Plans to build a 400 kV transmission line to transfer the wind power installed in the eastern part of Moldova are being discussed. The line will connect the grids of Moldova to the grids of Romania (Financiarul, 2009).

In 2003 the World Bank approved the Moldova Energy II Project worth 35 million USD. The objectives of the project are to improve the security and reliability of the electricity transmission system; the project also aims to improve the availability and quality of heating in selected residential and public buildings. The project is investing a majority of their efforts in the power system infrastructure as well as heat supply and consumption (World Bank, 2003). So far, the project has improved heating in 23 schools and 12 medical institutions, which benefits about 8,400 students and 1 million patients and hospital staff (World Bank, 2009).

The potential for renewable energy sources in Moldova has not been realized. It is estimated that renewable energy resource potential should account for 5-6 percent of the total energy production in 2010.

The table below displays summary statistics about Moldova.

Demographical Information	
Population, millions (2009)	4.32
Land area, thousand sq km (2009)	33.8
Macroeconomic Information (2008)	
GDP, billion US\$	10.6
Real GDP growth rate, percent	7.30
Foreign direct investment (net), million US\$ (2007)	447
Electricity disposition, billion kWh (2006)	
Generation	3.82
Consumption	5.81
Exports	0.23
Imports	3.74
Generation capacity, GW (2005)	
Nuclear	0.00
Thermal	0.97
Hydro	0.06
Other renewables	0.00
Total	1.03
<i>Sources: CIA World Factbook, U.S. Energy Information Administration, United Nations Conference on Trade and Development.</i>	

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2. Energy Policy, Barriers and Incentives

Moldova's energy policy is controlled by four organizations; the Ministry of Economy and Reforms, the Ministry of Energy, the Ministry for Territorial Development, Construction and

Communal Government, and the National Energy Council. The Ministry of Energy coordinates the energy sector and includes Moldelectrica, Moldovagas, the State Fuel Association, the National Agency for Energy Regulation (ANRE), and the National Agency for Energy Conservation. The Ministry for Territorial Development, Construction and Communal Government supervises the thermal energy sector, while National Energy Council (a self-financed non-governmental organization) advises the Moldovan government on energy and energy efficiency policies.

ANRE was established in December 1998 for the purpose of regulating the electricity, natural gas, and district heating sub-sectors, and also to promote competition in the energy markets. ANRE oversees energy tariffs, and its Tariff Calculation Methodology (TCM) was adopted in June 1999, using a cost-plus system.

In addition, there is a National Agency for Energy Conservation and also a new Association of Energy Consumers in Moldova, which represents consumers of electricity, especially industrial firms, in the regulatory process. The U.S. Agency for International Development (USAID) is assisting this new association in its development.

As for energy policy, the Energy Strategy until 2020 was approved by the Republic of Moldova in 2007. It is designed to increase the countries renewable energy production to 6 percent in 2010 and 20 percent in 2020. The strategy has designed objectives, measures, and activities oriented toward creating a more efficient, reliable and competitive national energy industry. Listed below are some of the strategy's fundamental principles.

- Energy supply systems oriented towards serving the needs of the customer.
- Reasonable tariffs and the development of a favorable investment climate.
- Enhancing Moldova's role as an important transit country for electricity and gas.

The Law on Renewables was approved by the parliament in July 2007. This law mandates the purchase of energy and fuels produced by renewable energy suppliers. The national regulator has an obligation to approve tariffs up to 15 years to stimulate investments (EAE, 2009).

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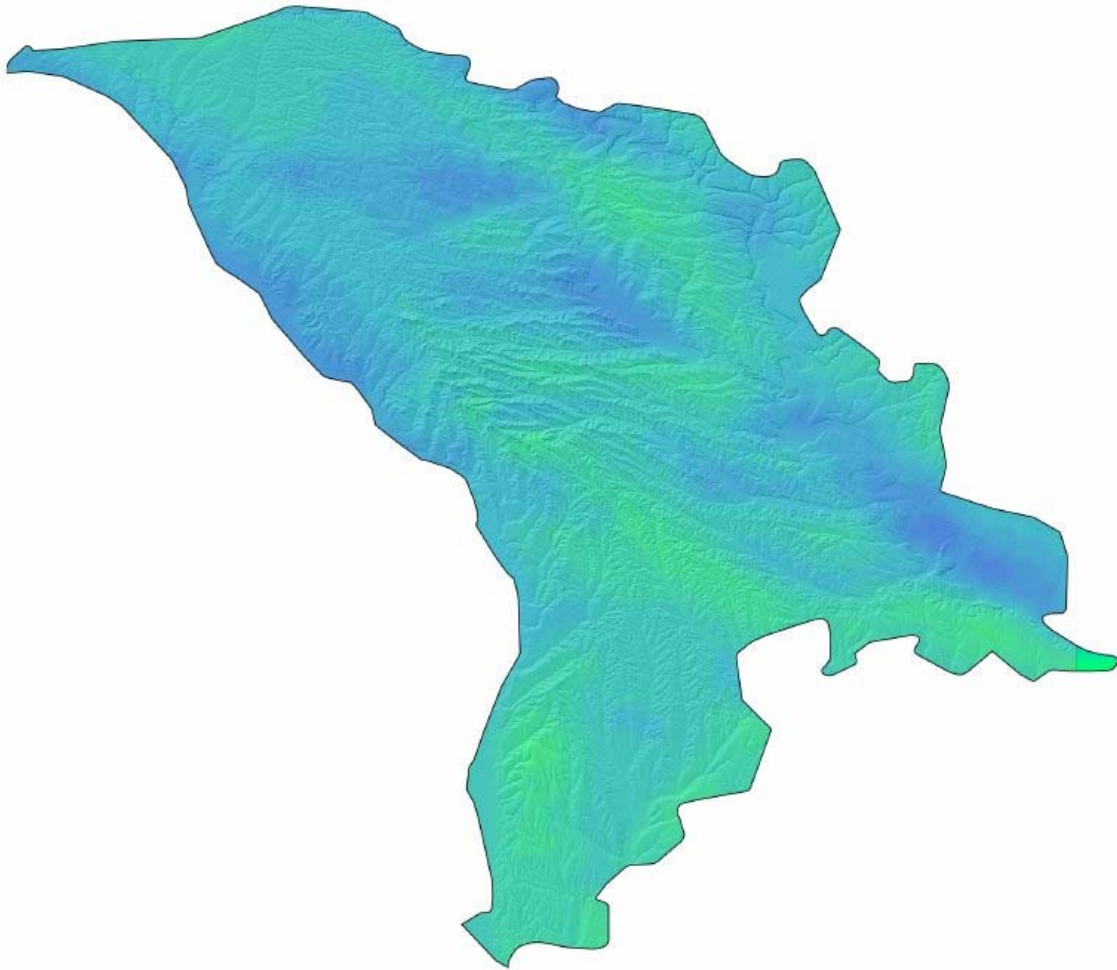
3. Wind

Moldova has a technical wind potential of 1 GW of capacity, which would produce 11 TWh per year.

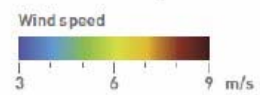
Plans to build a 400 kV transmission line to transfer the wind power installed in the eastern part of Moldova are being discussed. The line will connect the grids of Moldova to the grids of Romania (Financiarul, 2009). More information concerning the wind installation in eastern Moldova could not be found.

Moldova Wind Resource Map (Source: 3Tier)

Moldova Wind Map at 80m



5km Wind Map at 80m



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4. Biomass

While there is some experience with small scale rural biomass applications in Moldova, there is no experience of larger scale or more efficient use. The main generators of biomass suitable for energy purposes are forestry, agriculture, food industry and housing services. Forms of freely available heating fuel are currently used for heating, including sunflower stems, shelled maize cobs, maize stalks, and other agricultural wastes supplementing coal and wood for domestic fires and stoves (1-5KWth range). Biomass is used inefficiently due to simple and outdated technologies – domestic fires and stoves with an efficiency rating estimated not to exceed 50 percent. Statistic reported in 2001 estimated that 70 kg of wood is used for combustion per family in the rural area per year (Ceban, 2005). Some biomass materials are unused, as they are not available in a form that can be used with existing technologies.

The technical potential for biomass in Moldova is 19.4 PJ. This total includes agricultural wastes (7.5 PJ), fuel wood (4.3 PJ), wood processing wastes (4.7 PJ) and biogas (2.9 PJ). Another 2.1 PJ is the estimated potential for biofuels in the country (Ceban, 2005).

The World Bank is sponsoring a direct-fired biomass pilot project with a capacity between 50 and 500 kW. The plant will utilize agricultural waste (EBRD, 2008). In 1999 Moldova installed their first experimental equipment using briquettes from agricultural wastes. The installation produces 250 kg of briquettes per hour (Ceban, 2005).

Moldova has sufficient biomass resource to provide significant generation if utilized. As biomass begins to be used more efficiently in communal applications, experience should allow for large scale implementation, in the range of 5 MWth and greater. There is good potential for biomass to be included in social infrastructure and energy system development programs. There is also developing cross-border cooperation, especially with the Ukraine

Biomass resource type	Total production	Production density
Total land area covered by	(avg. 2006–2007, km ²)	(avg. 2006–2007, %)
Arable Land	18,265	54
Permanent Crops	3,025	9
Permanent Meadows and Pastures	3,620	11
Forest Area	3,299	10
Other Land	4,681	14
Inland Water	960	3
Primary crop production	(avg. 2006–2007, tonne)	(tonne / 100 km ²)
Total primary crops (rank among COO)	4,431,803 (13)	13,281 (24)
Top 10 primary crops		
Sugar beet	894,653	2,681
Maize	842,593	2,525
Wheat	546,709	1,638
Grapes	287,978	1,594
Potatoes	287,978	863
Sunflower seed	267,931	803
Apples	187,395	562
Barley	157,554	472
Watermelons	89,508	268
Soybeans	81,887	245
Animal units, number	(avg. 2006–2007, number)	(number / 100 km ²)
Cattle	304,791	913
Poultry	22,383,000	67,075
Pigs	496,248	1,487
Equivalent animal units	727,120	2,179
Annual roundwood production	(2006–2007, m ³)	(m ³ / 100 km ²)
Total	188,000	563
Fuel	94,000	282
Industrial	94,000	282
Wood-based panels	10,000	30
	(2006–2007, tonne)	(tonne / 100 km ²)
Paper and paperboard	0	0
Recovered paper	0	0

Source: Food and Agriculture Organization of the United Nations

Moldova Biomass Resource Data

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5. Solar

In spite of absence of own traditional energy resources and the vital necessity of using alternative energy sources in Moldova, solar energy has no noticeable usage.

The first stage of solar energy use in Moldova will have the following priorities:

- Heating of water using solar collectors
- Drying fruit, vegetables and medicinal plants
- Photovoltaic conversion for pumping water and for electric energy supply of small consumers

Installation is estimated to be approximately 102,000 m² of solar collectors designed to heat water, about 60,000 m² for drying agricultural produce, and over 5000 m² of photovoltaic systems with the installed power of 300 kW.

The measurements of solar radiation were carried out in Moldova only at one point; Kishinev, the country's capital. The data on monthly and annual solar radiation were averaged over the observation period of many years are presented in tables below.

Location	Kishinev
Jan	126
Feb	166
Mar	303
Apr	460
May	607
Jun	692
Jul	685
Aug	598
Sep	440
Oct	281
Nov	117
Dec	92
Yearly	4567

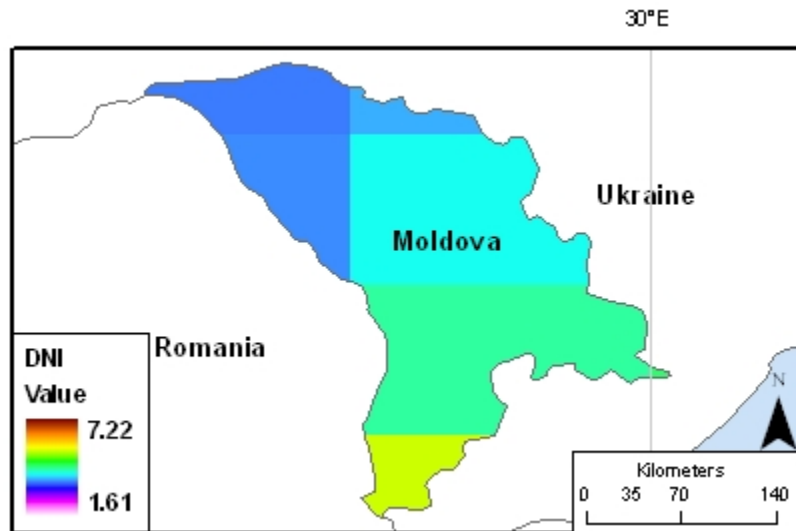
Monthly and annual total solar radiation incident on horizontal surface, MJ/m²

Location	Kishinev
Jan	140
Feb	143
Mar	253
Apr	355
May	464
Jun	574
Jul	591
Aug	559
Sep	450
Oct	338
Nov	124
Dec	95
Yearly	4086

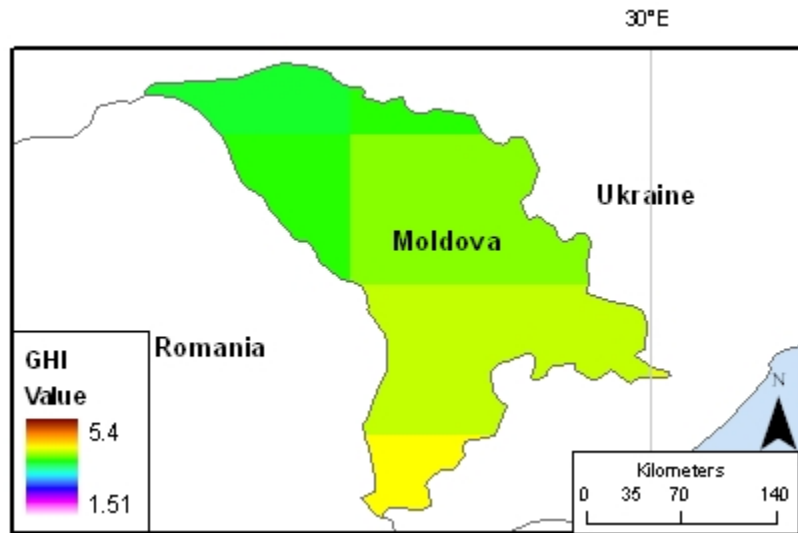
Monthly and annual direct solar radiation incident on surface normal to sunlight beams, MJ/m²

The following figures display the direct normal insolation and global horizontal irradiance for Moldova. As shown, the greatest potential for solar is in the most southern tip of the country; however, the insolation and irradiation values are not extremely significant in this region.

Moldova Solar Direct Normal Insolation (Source: NASA)



Moldova Solar Global Horizontal Irradiance (Source: NASA)



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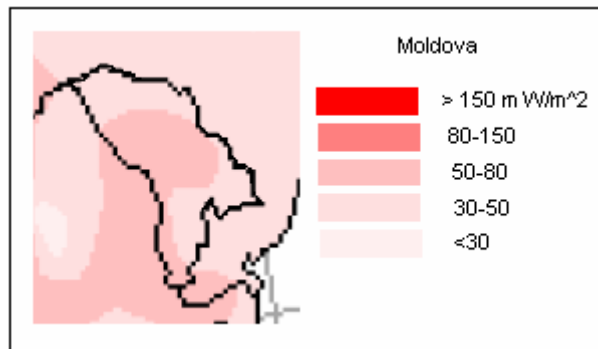
6. Geothermal

On the basis of studies of oil and gas prospecting holes, the reservoirs of thermal water with temperature 30-50°C were found in Moldova. The usage of thermal water is absent, and there is no national program for geothermal resources.

The highest temperature of 50 °C was measured at a depth of 1 km, southeast of Moldova near the city of Kagul. In the west at the foothills of the Carpathian Mountains, near the city of Ungueni, a well was drilled to the crystalline basement, which had a maximum temperature of 46 °C. The resources of thermal water were not determined. There are no fields with high temperature thermal water in Moldova.

Moldova does have a low enthalpy heat flow area in the central part of the country as shown in the map below.

Heat Flow ($m W/m^2$) in Moldova



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8. *Relevant Links*

Please see webpage for relevant links.

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9. *References*

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10. *Country Contacts*

Contacts made in the preparation of this assessment are gratefully thanked for their contribution to this report. Please see webpage for contacts listing.

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