Hungary

Country Profile

1. Overview
2. Policy and Incentives

3. Wind
4. Biomass
5. Solar
6. Geothermal
7. Hydroelectric

8. Links
9. References
10. Country Contacts

1. Overview of Electricity Supply

The Republic of Hungary's power consumption levels have been roughly constant over the last 15 years. In 2001, the government implemented a plan that projected primary energy supply to grow at an annual rate of approximately 1 percent between 2000 and 2020. By 2020, the share of coal is expected to decrease to 11 percent, oil to remain roughly stable at 31 percent, and gas to grow slightly to 41 percent. Nuclear is expected to decrease to 13 percent. This scenario estimated the growth of the share of renewables from 3.6 percent to about 7 percent by 2010.

Summary information about Hungary is displayed in the table below. A majority of Hungary's energy is produced from oil and gas imports from Russia. A third of the electricity in the country is produced by the Paks nuclear power plant. In 2004 Parliament voted to extend the lifetime of the plant and to increase the capacity of the plant.

Demographical Information	
Population, millions (2009)	9.91
Land area, thousand sq km (2009)	93.0
Macroeconomic Information (2008)	
GDP, billion US$	205.7
Real GDP growth rate, percent (2007)	- 1.5
Foreign direct investment (net), million US$ (2007)	1,455
Electricity disposition, billion kWh (2006)	
Generation	37.66
Consumption	37.11
Exports	10.69
Imports	14.68
Generation capacity, GW (2005)	
Nuclear	1.87
Thermal	6.30
Hydro	0.05
Other renewables	0.41
Total	8.62

Sources: CIA World Factbook, U.S. Energy Information Administration, United Nations Conference on Trade and Development.

Hungary Country Summary Table

Hungary has had some major developments in their energy sector the past few years. The 2005 Electricity Act is increasing the potential for competition in the electricity and gas markets, and in January 2004 all non-residential electricity consumers became eligible to participate in the liberalized market. Also, in January 2006 the Hungarian grid operator, MAVIR, gained enhanced powers and responsibilities (IEA, 2007).

There is currently a push in the Hungarian energy sector to move from coal and fuel oil dependent generation to natural gas. Units have been repowered with combustion turbines, and all newly proposed major facilities are simple cycle or combined cycle plants. After the gas dispute between Ukraine and Russia in 2006, the Hungarian government placed greater emphasis on diversification of suppliers. The country has also supported the development of new routes to bring gas into Europe (IEA, 2007).

The figure below shows the location of existing generation and transmission systems in Hungary. The transmission grid consists of an extensive network of 750 kV, 400 kV, 220 kV, and 120 kV lines. To provide further opportunity for trade and stability of supply, the grid has been recently expanded in two major projects: interconnection with the Western Europe UCPTE system in 1995; and 400 kV interconnection with Croatia in November 1999.

Hungarian Electricity Infrastructure

Hungary is a signatory to the Kyoto Protocol, and they have implemented all the climate change legislation required by EU law. Hungary's climate change policy is driven by its international commitments. Emissions in Hungary fall far below the limits, so domestic needs for reduction have not been a priority. However, a climate change strategy will be developed and published (IEA, 2007).

Attracting foreign investment is a priority for the Hungarian government. A substantial body of law and a number of treaties protect foreign investment in Hungary, provide for national treatment, and ensure profit repatriation. Hungary's accordance to the EU standards, supported by all major political parties, further affirms the country's commitment to an open investment regime.

(return to top)

2. Energy Policy, Barriers and Incentives

Hungary's energy policy is oriented in compliance with European Union (EU) energy policy and has the following main guidelines:

- Security of hydrocarbon supplies and diversification of import sources to reduce dependence on Russia.
- Promotion of energy efficiency by encouraging energy conservation and modernization and the elimination of the remaining price distortions.
- Price deregulation and the opening of all sectors to competition.

- Environmental protection.
- Attracting foreign capital for investment in capital-intensive energy projects.

As in other fields of energy policy, complying with EU requirements appears to be the principal driving force. Increasing the country's renewable energy use from presently 3.5 percent to 6-7 percent by 2010 is another policy aim. As a Joint Implementation project, emission reduction units can be traded to another country.

Support Mechanisms and feed-in conditions for electricity from renewable energy sources include Feed-In Tariffs that were introduced through the Electricity Act which entered into force on 1st January 2003. According to the Regulation Nr. 105/2003. (XII.29.) GKM, the Electricity Suppliers are obliged to purchase electricity from producers utilizing RES, if their capacity is over 100 kW. However, in the case of smaller plants, individual arrangements are possible. There is no differentiation between the renewable sources. Hungarian law gives renewables priority access to the grid for eight years. The feed-in tariff in 2008 was 10.04 Eurocents/kWh (Urbschat, 2009).

A new legal framework was approved in 2007. Instead of the tariff being guaranteed for the life of the installation, the new regulation limits the guaranteed feed-in tariff to a licensed period and amount.

The Electricity Act intends the Feed-In Tariffs to be an intermediate solution which should lead to a green certificate system. However, this step needs further legislative procedures and no date for its realization has been fixed.

From July 2007, a tax allowance of 0.04 USD per liter for 4.4 percent biofuel blended into petrol. The same allowance applied to diesel oil starting in January 2008. Sales of biofuels in Hungary receive a tax benefit, and to avoid a tax gap, petroleum that does not contain biofuel carries a tax penalty (EREC, 2009).

Hungary also supports investment subsidies for all renewable energy sources. The Operative Program for Environment and Energy, financed by EU funds, will promote incentives to renewable energy technologies from 2007-2013. The National Energy-Saving Program also promotes renewable energy through subsidies, which can be combined with soft loan from the Energy Saving Credit Program 2008. The maximum subsidy is 25 percent of the investment cost or 1,000,000 forit per flat. The Energy Saving Credit Program 2008 also offers low-interest loans for renewable energy projects (EREC, 2009).

(return to top)

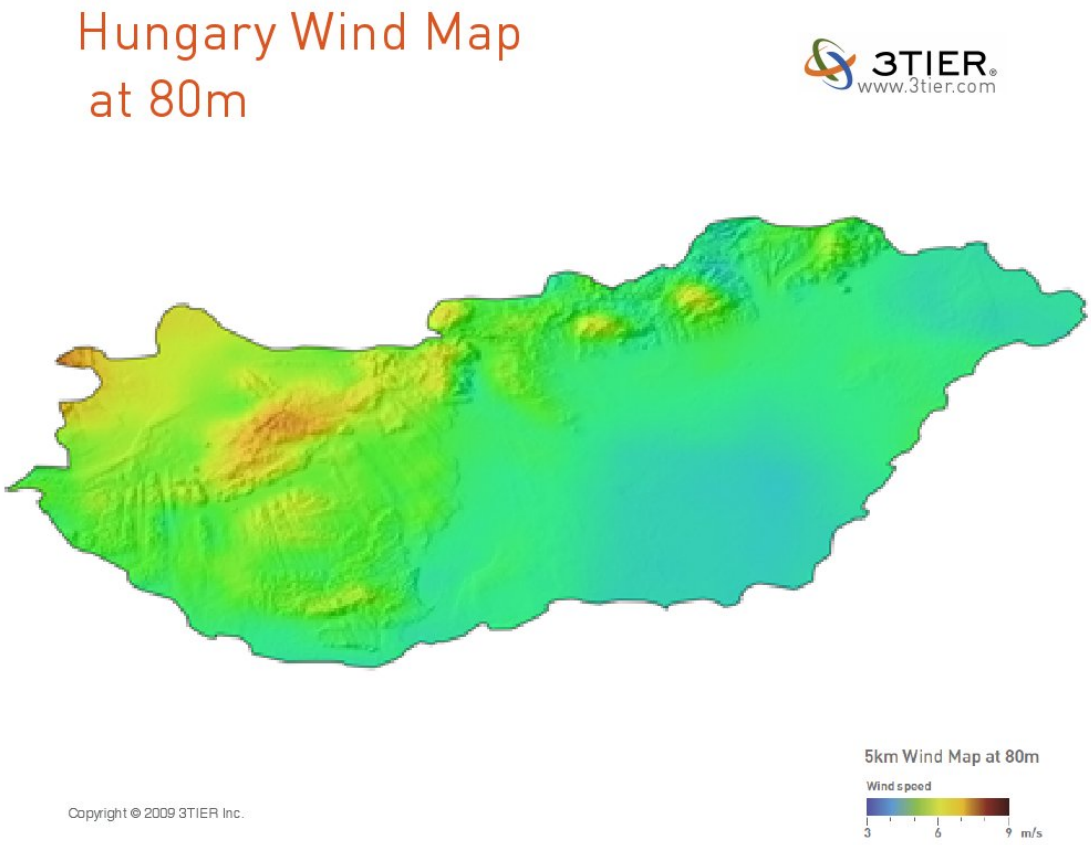
3. Wind

In the last decade there have been several wind projects built. All investments were partly financed by the Hungarian government and the electricity sold to the national grid will pay off the investments in an estimated ten years. There is currently 143 MW of wind capacity installed in Hungary. Hungary has 20 wind farms installed ranging from 250 kW to 60,000 kW in capacity. An additional 330 MW have been planned for the country (UDI, 2009). Many small scale wind energy uses are also under development. Hungary has a grid access guarantee for wind projects.

In general, wind energy in Hungary is thought of as having low potential. This is not necessarily true; the 600 kW wind project in Kulcs has operated at a relatively good capacity factor (approximately 28.5 percent). Also, Austria's largest wind farm has been built just across the border, implying a good regional resource.

As shown in the following figure, Hungary's most significant wind potential is located in the northwestern region of the country.

Hungary Wind Resource Map (Source: 3Tier)



(return to top)

4. Biomass

Biomass accounts for the largest share of Hungary's renewable energy consumption. Currently fuel wood combustion is the primary use of biomass. Forestry wastes and sawmill byproducts are currently burnt in furnaces to provide heat for the forestry industry or briquetted for retail sale. Nearly 40 percent of the roundwood production is used for energy purposes.

Despite the extensive use of forestry wastes for energy production, it is estimated that only 10 percent of this resource is currently being utilized. The significant amount of forestry byproducts could potentially be used to generate electricity on a large scale, or more completely utilized to supply for heat residential and industrial needs.

It is estimated that 40 percent of exploited wood could be used for energy production. Also, during wood processing about 20 percent of the wood becomes a by-product. With these estimations in mind, the energy potential in Hungary is estimated to be approximately 62 PJ (Ukrainian Biofuels, 2008).

Energy plantations can yield between 200 and 350 GJ/ha/year, which is more than double the about of energy from forest yields per hector. Only about 10 - 20 percent of the main agricultural products could be used for energy. This proportion amounts to approximately 40 - 80 PJ/year. In addition, about 40 - 60 percent of agricultural by-products can be used for energy production, which is approximately 90 - 185 PJ. In total and with other resources included, the agricultural energy potential for Hungary is 296 - 402 PJ (Ukrainian Biofuels, 2008).

An effective program exists in Hungary for modernizing landfills. Biogas production has not been utilized in landfills, but the possibility has been considered.

Biomass resource type	Total production	Production density
Total land area covered by	(avg. 2006-2007, km²)	(avg. 2006-2007, %)
Arable Land	45,945	49
Permanent Crops	1,975	2
Permanent Meadows and Pastures	10,160	11
Forest Area	19,967	21
Other Land	11,563	12
Inland Water	3,420	4
Primary crop production	(avg. 2006-2007, tonne)	(tonne /100 km²)
Total primary crops (rank among COO)	21,865,625 (21)	23,504 (28)
Top 10 primary crops		
Maize	8,340,833	8,966
Wheat	4,182,206	4,496
Sugar beet	2,227,113	2,394
Sunflower seed	1,106,480	1,189
Barley	1,058,292	1,138
Potatoes	547,872	589
Apples	537,673	578
Grapes	532,951	573
Maize, green	513,663	552
Rapeseed	418,103	449
Animal units, number	(avg. 2006-2007, number)	(number / 100 km²)
Cattle	705,000	758
Poultry	40,376,500	43,402
Pigs	3,920,000	4,214
Equivalent animal units	2,676,765	2,877
Annual roundwood production	(2006-2007, m³)	(m³ / 100 km²)
Total	5,776,500	6,209
Fuel	3,062,500	3,292
Industrial	2,714,000	2,917
Wood-based panels	750,000	806
	(2006-2007, tonne)	(tonne / 100 km²)
Paper and paperboard	552,500	594
Recovered paper	400,500	431

Source: Food and Agriculture Organization of the United Nations

Hungary Biomass Resource Data

(return to top)

5. Solar

Hungary lies in the middle of a basin, on a relatively flat surface surrounded mainly by mountains, and has favorable solar conditions compared to other European countries. The number of the annual sunny hours is 1,900-2,200, and the average annual total of the incident sunshine is 1300 kWh/m^2.

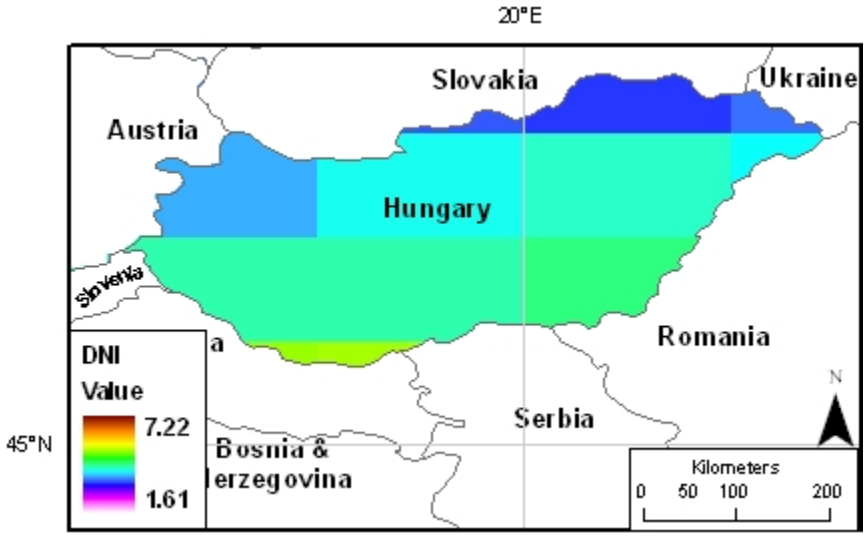
Adequate potential for low intensity solar energy has been identified. There are approximately 300-350 kW of photovoltaic installations that produce electricity throughout the country. The most common collector used in Hungary is the flat-plate collector; however, demand for flat-plate, vacuum, and unglazed collectors has been strongly increasing. Hungary has also developed a national PV sales market with contributing companies such as Dunasolar Rt, Helio Grid Magyarorszag Napelemgyaro, Sanyo Hungary Kit, and Genesis Energy Nyrt (Urbschat, 2009).

The largest PV system in Hungary was completed in 2005 and is located outside of Budapest in Godollo. The 10 kWp plant is a power producing plant at the Szent Istvan University. The system has three different substations that all apply different technologies (Szent Istvan).

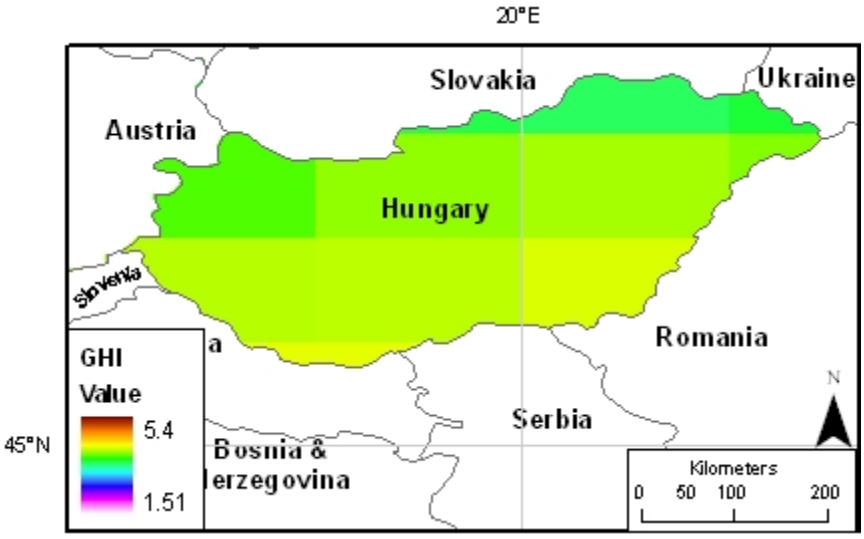
Despite not having many applications using solar power itself, Hungary has a manufacturing plant that is a subsidiary of a solar PV company. Solar Thin Films, Inc is a United States based company with its machinery manufacturing subsidiary, Kraft Electronikai Srt., based in Budapest, Hungary (HVPV, 2008).

The following figures provide direct normal insolation and global horizontal irradiation values for Hungary. As shown, a majority of the country has low intensity solar resource.

Solar Direct Normal Insolation in Hungary (Source: NASA)



Solar Global Horizontal Irradiance in Hungary (Source: NASA)



(return to top)

6. Geothermal

Hungary has some of the largest reserves of geothermal energy in Eastern Europe. Generally, the identified resources are low to medium enthalpy, 50 °C to 200 °C, and more suitable for heat supply than electricity production. Because of this condition, there is currently no utilization of geothermal energy for electricity production.

There has been considerable use of the low to medium enthalpy geothermal energy throughout Hungary. The main consumers of geothermal heat are in the agriculture industry for the heating of greenhouses, spas and pools. The residential and industrial demands have led to over 2,000 wells currently in operation supplying over 7,940 TJ per year to Hungary. Hungary has seven geothermal sites with temperatures greater than 100 °C as shown in the table below.

Site Name	Temperature (°C)
Szentes	72-143
Szarvas	82-154
Almosd	93-143
Melykut-Pusztamerges	108-110
Oros	142-167
Nagyszenas-Fabiansebestyen	150-254
Algyo	156
Source: Geothermal Resources in Hungary, Bob Lawrence & Associates, Inc.	

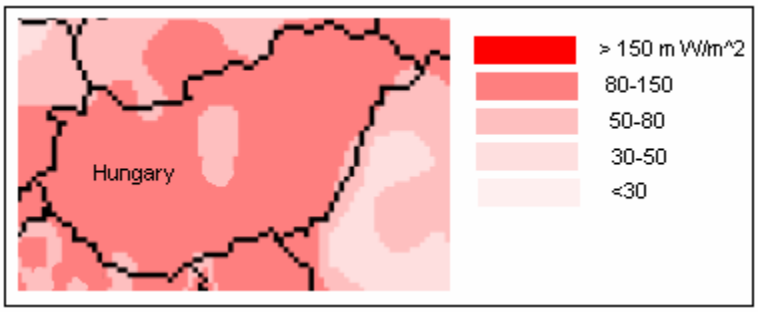
Geothermal Sites in Hungary with Temperatures Greater Than 100 °C

Geothermal installations in Hungary have been estimated as having a total capacity of 694.2 MWt used only for heat generation. Installations are used in a variety of applications:

crop drying, green house heating and district heating, with approximately one third of the country having useful geothermal resources.

The primary geothermal resource area in Hungary is the Upper Pannonian reservoir system that extends through nearly the entire country and enters some of the adjoining countries. The basin is surrounded by the Alps, Carpathians, and Dinarides, which form the large low enthalpy aquifer. This is the system that is used for heating of horticultural facilities. The figure below identifies the heat flow throughout the country.

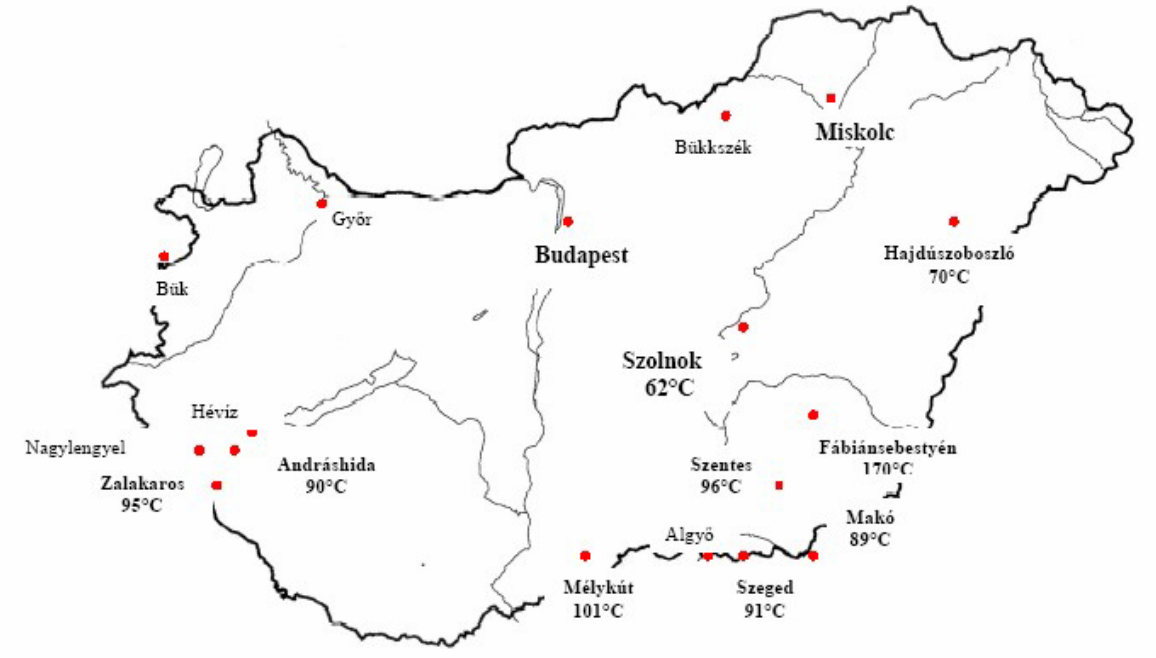
Heat Flow (m W / m^2) in Hungary



(*Source: Energie-Atlas GmbH ©2005*)

The following figure depicts the location and temperature regions of the Hungarian Upper Pannonian water wells.

Hungarian Upper Pannonian Water Wells



(return to top)

7. Hydroelectric

Hungary is one of the less mountainous countries in central Europe, and therefore has only limited hydroelectric potential. Hungary has little potential for further water power development with the exception of small and micro sized power plants. Hydroelectric plants in Hungary generally produce approximately 0.18 billion kWh each year, which is about 0.5 percent of the total electricity produced.

(return to top)

8. Relevant Links

Please see webpage for relevant links.

(return to top)

9. References

Elemer Bobok and Aniko Tóth, Geothermal energy production and its environmental impact in Hungary, September 2003.

European Bank for Reconstruction and Development, Transition Report Update: May 2002, London: EBRD Publications Desk, 2002.

European Commission. The European Renewable Energy Study. Luxembourg: Office for Official Publications for the European Communities, 1992.

Hudson Valley Photovoltaic Alliance, "Solar Thin Films, Inc. Enters Into Agreement with Ulster County, New York to Establish a Solar Module Manufacturing Facility," Aug. 2008.

Intelligent Energy Europe, "Renewable Energy Policy Review: Hungary," EREC, March 2009. Available online: www.erec.org.

International Energy Agency (IEA), "Energy Policies of IEA Countries: Hungary," 2006 Review. Available online: www.iea.org.

Szent Istvan, "Solar Energy." Available Online: www.greenet.info/documents/godollo.pdf.

UDI, "World Electric Power Plants Database," June 2009.

Ukrainian Biofules Portal, "Total Energy Potential of Forest and Agricultural Biomass in Hungary," April 2009. Available online: http://pellets-wood.com/total_energy_potential_of_forest_and_agricultural_biomass_in_hungary-o418.html

United Nations, "World Investment Report 2009," Conference on Trade and Development.

Urbschat, C., “Comparison of the Hungarian and German Solar Markets - Status & Perspectives,” Presented by German Solar Industry Association (BSW-Solar), March 2009.

(return to top)

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.

(return to top)