

Azerbaijan

Country Profile

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1. Overview of Electricity Supply

Azerbaijan is a newly independent country with vast potential energy resources. Slightly smaller than the state of Maine, Azerbaijan is a republic with a presidential form of government headed by Heydar Aliyev. Azerbaijan is at the geographical crossroads of the Middle East, Europe and Asia – an element that is reflected in its political, economic, and commercial development.

The Azerbaijan power system is the oldest and most developed in southern Caucasus. It has an installed generating capacity of about 5,500 MW, of which thermal power stations contribute 4,700 MW and hydropower stations make up the balance.

Currently, 80 percent of Azerbaijan's generating power is located in its western part. However, 70 percent of the power consumption is massed in the east, north-east and south-east. Therefore, fuel is transported hundreds of kilometers from the Absheron Peninsula to thermal power stations, Azerbaijan GRES and Ali Bayramli GRES. The energy produced is then transmitted to the Absheron Peninsula and from there is distributed to the northern and southern regions. As the west and east of Azerbaijan are connected by two transmission lines of 500 kV (one of which is energized at 330 kV), huge transmission losses take place.

Though the installed design capacity of Azerbaijan Power System is approximately 5,500 MW, only about 4,300 MW is available. The old infrastructure, deficiency of spare parts, and lack of scheduled maintenance is the main reason for the lack of full utilization. More than 35 percent of Azerenerji power stations have been operating for more than 30 years.

**Azerbaijan
Country Summary Table**

Demographical Information	
Population, millions (2003)	8.3
Land area, thousand Ha (2002)	8,660
Macroeconomic Information (2003)	
GDP, billion US\$	7.2
Real GDP growth rate, percent	11.20
Foreign direct investment (net), million US\$	2,353
Electricity sector	
Electricity tariff, US¢/kWh (2002)	2.0
Collection rate, percent (2002)	45
Load utilization factor, percent (2000)	NA
Electricity disposition, billion kWh (2003)	
Generation	20.00
Consumption	20.25
Exports	0.70
Imports	2.35
Generation capacity, GW (2003)	
Nuclear	0.0
Thermal	4.2
Hydro	1.0
Other renewables	0.0
Total	5.2
<small>Sources: European Bank for Reconstruction and Development, U.S. Energy Information Administration, Food and Agriculture Organization of the United Nations.</small>	

A wave of privatization took place in the mid-1990s, but was then continually deferred until new privatization legislation could be passed spelling out all the regulations and possible methods and establishing a monitoring commission. The law was approved in 2000. The law allows privatization to take place by auction, preferential share sale to employees and after bankruptcy declaration. The law still allows individual privatization plans to be drawn up for strategic enterprises. It also stipulates more clearly what liabilities will be taken on by the new owner of a privatized company - economic liabilities, such as already-existing environmental damage, will not be transferred.

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2. Energy Policy, Barriers and Incentives

The main energy policy objectives of Azerbaijan are:

- Modernization
- Maintaining state control

In a November 2003 decree, the President of the Republic of Azerbaijan assigned the Cabinet of Ministers of the Republic of Azerbaijan in collaboration with related state bodies to prepare and submit to the President of the Republic of Azerbaijan relevant proposals on use and development of alternative energy resources put in global practice (solar energy, wind energy, thermal waters' energy and small hydroelectric stations).

Additional energy policy, barriers and incentives include:

- All renewable energy - there are no specific incentives for the implementation of renewable energy projects in Azerbaijan.
- All renewable energy - lack of interest and governmental support of renewable energy development due to favorable status of the power lobby in the country
- All energy - poor condition of electrical infrastructure
- All renewable energy - insufficient investments in pilot and demonstration projects
- All renewable energy- large volumes of oil production makes the use of thermal water uncompetitive
- All renewable energy- low tariffs for electricity and heat

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3. Wind

There is no installed wind energy capacity in Azerbaijan, one of the oldest oil producing countries in the world. In the last few years only small autonomous wind units were used for irrigation and lighting. The number and current operating conditions of these units is not known. A recent project sponsored by the Ministry of Industry and Energy will include the construction of a 1 MW turbine in the Khizi District, about 100km west of Baku. That project is expected to be in operation in 2006.

Built during the Soviet era, Azerbaijan's power infrastructure is generally in poor condition, with minimal public investment and maintenance since independence. The country's economic contraction during the mid-1990s, along with systemic problems--such as prices capped below the market rate and frequent non-payment by customers--have left Azerbaijan's power sector without sufficient capital to upgrade aging power-generation facilities.

A country wide wind-atlas is available, where one main area with annual average wind speeds of more than 6 m/s were identified. The "Master Plan of Wind Power Development of the USSR till 2010", published in 1989 included a country-level wind map. The resource potential was estimated for 30m above ground. The wind map identifies areas above "6 m/s", but there is no indication of the actual value. This value could be anywhere between 6 and 10 m/s.

The wind energy resource potential of 110×10^9 kWh/y estimated in the study is probably accurate. Thus, at an average capacity factor of 25 percent, there is a total of 3,000MW of wind power capacity. Under these circumstances the technical wind energy resource potential of Azerbaijan is good.

The most promising sites are on the Apsheron Peninsula in the east along the Caspian Sea. Caspian Sea zone and the Kura River lower reaches and Nakhichevan Autonomous Republic also seem to have a good potential.



Map No. 3761 Rev. 2 UNITED NATIONS February 1988

Department of Public Information Cartographic Section

Wind Atlas of Azerbaijan

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4. Biomass

No biomass energy projects were identified in Azerbaijan. The area of forests in the country is 14,400 km², equivalent to 3.2 percent of the overall territory. There are significant agricultural operations in the country, which could provide residues for biomass combustion or gasification, as well as wastes for biogas production from animal manures. There may also be potential for methane production from landfills.

Azerbaijan is the largest amongst Republics of the former USSR and fourth in the world in production of raw cotton. The population of Azerbaijan is using the waste of cultivating cotton and cereal crops as a fuel in private household equipment. No large scale projects were identified, although it is feasible to further utilize these residues in a larger application.

Reconstruction of treatment systems for municipal sewage in Baku and other large cities for the further utilization of biogas has been envisioned.

Azerbaijan Biomass Resource Data

Biomass resource type	Total production	Production density
Percent of total land area covered by		14%

Forests	17%	
Shrublands, savanna, and grasslands	64%	
Cropland and crop/natural vegetation mosaic	1%	
Urban and built-up areas	2%	
Sparse or barren vegetation; snow and ice	2%	
Wetlands and water bodies	14%	
Primary crop production, tonne	(avg. 1999–2001, tonne)	(tonne / 1000 Ha)
Total primary crops (rank among COO)	7,806,794 (18)	901 (19)
Top 10 primary crops		
Mixed Grasses, Legumes	2,600,000	300
Maize for Forage & Silage	1,200,000	139
Wheat	1,189,327	137
Potatoes	479,325	55
Tomatoes	370,678	43
Apples	281,767	33
Watermelons	252,579	29
Vegetables and Roots, Fodder	231,667	27
Barley	208,967	24
Vegetables Fresh (misc)	133,000	15
Animal units, number	(number)	(number / 1000 Ha)
Cattle	1,933,270	223
Poultry	12,972,000	1,498
Pigs	22,900	3
Equivalent animal units	2,072,150	239
Annual roundwood production	(1996–98, 000 m ³)	(m ³ / Ha)
Total	NA	NA
Fuel	NA	NA
Industrial	NA	NA
Wood-based panels	NA	NA
	(1996–98, 000 metric tons)	(metric tons / Ha)
Paper and paperboard	NA	NA
Recovered paper	NA	NA

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5. Solar

Unlike Armenia and Georgia, the two neighboring republics, Azerbaijan possesses a considerable amount of oil. The large quantities of fossil fuel resources is one of the main reasons solar energy resources have not been exploited.

The solar energy potential in Azerbaijan is very high due to the favorable climatic conditions. The data below references three locations in Azerbaijan: Artem-Island, Minguechaur and Nakhichevan. The first is located near Apsheron at Caspian Coast, the second, in the Northwest part of the country, and the third is located in the Azerbaijan enclave between Armenia and Iran.

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

Location	Artem-Island	Minguechaur	Nakhichevan
Jan	176	178	221
Feb	228	234	297
Mar	378	361	456
Apr	552	503	565
May	737	667	714
Jun	804	712	812
Jul	801	722	850
Aug	707	632	769
Sep	512	458	609
Oct	403	345	439
Nov	222	196	279
Dec	159	150	193
Yearly	5679	5158	6204

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

Location	Artem-Island	Minguechaur	Nakhichevan
Jan	177	210	209
Feb	181	246	265
Mar	251	292	430
Apr	433	395	469
May	630	534	643
Jun	774	622	842
Jul	745	632	895
Aug	662	573	838
Sep	506	444	756
Oct	337	391	579
Nov	206	236	383
Dec	162	193	232
Yearly	5064	4760	6541

The solar energy resource potential is high throughout practically the entire territory of Republic. It is especially high in the areas of Apsheron and Nakhichevan.

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6. Geothermal

The exploration and evaluation activities in Azerbaijan indicate a high potential for geothermal development. Prospective sources are recommended for therapeutic baths, industrial, and energy applications. Use of thermal waters for greenhouse heating in the Lenkoran region,

Average annual hydropower generation in Azerbaijan amounts to 1.5 billion kWh, meeting 15 percent of power and 10 percent of energy demands of the power system. The developed hydro potential accounts for one tenth of gross theoretical value.

Potential hydro resources of Azerbaijan are rather scarce, but by concentration of hydro resources on the territory the potential is significant as compared to other CIS countries.

Water resources of Azerbaijan are presented by:

- the lower reaches of the Kura River with its multiple tributaries
- the Aras River (the Kura tributary), which is on the border
- a group of creeks inflowing into the Caspian Sea

At estimation of total hydropower potential of Azerbaijan, small hydro was singled out. The largest small hydro potential is concentrated in multiple tributaries of the Kura and the Aras rivers and a group of creeks inflowing into the Caspian Sea.

Small hydropower development is the most promising in power sector. Under existing conditions it is technically and economically feasible to develop vast potential of small creeks, use drops on the irrigation canals, water releases from reservoirs, which will permit construction of small HPPs on the territory of the Republic with combined capacity of about 240 thou.kWh.

Further hydro development of the Republic is connected with significant available economically feasible hydropower capability. There is a Master Plan of hydropower development of the Republic.

Nakhchivan Autonomous Republic has been in an energy deficit since 1990. At present the Nakhchivan local power system is isolated from the rest of Azerbaijan and it is feasible to start small hydro development on the territory.

Favorable Factors for Development of Hydro Potential

- Deficit of fuel and escalation of organic fuel prices
- Yearly growth of electricity consumption in the country
- Azerbaijan Ministry of Economic Development is working at privatization of small hydro

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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: