

## Morocco

**Official Name:** Kingdom of Morocco.

**Category:** Geography of Energy.

**Summary:** Morocco is heavily dependent on foreign sources of energy and lacks a domestic supply of traditional energy sources. The country is diversifying its energy matrix by developing renewable sources such as solar energy, hydropower, and wind.

Morocco is the only country in north Africa that does not have substantial fossil fuel reserves. Unlike its neighbors Algeria and Mauritania, who have large oil and gas reserves, Morocco must rely on foreign imports of energy. In 2010, Morocco imported 97 percent of its energy, making it the largest energy importer in Africa and economically sensitive to energy prices of the global market. Although the country lacks traditional sources of energy, it has a large, underdeveloped potential for renewable energy. In 2008, the government enacted a new energy strategy with a focus on developing renewables as a way to continue broader development.

Morocco has an emerging economy that experienced steady growth of 4 to 5 percent between 2000 and 2010. As the economy grows, Morocco becomes more dependent on foreign sources of

energy, with continual growth in imports of crude oil, petroleum products, coal, and electricity. Forecasts by the Moroccan government predict that primary energy demands could increase three to four times by 2030. This growth presents a challenge to the government because current power production is insufficient to meet demand, and Morocco must therefore rely on electricity importation through interconnections with Spain and Algeria.

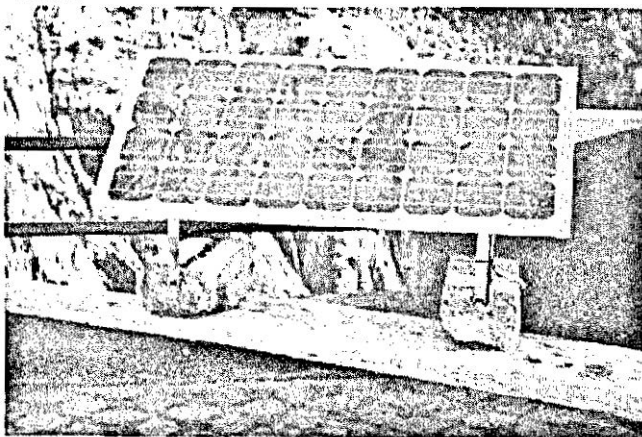
### Growth of Demand and Rising Costs

In Morocco, there is a large difference between the growth of energy demand and rising energy costs. Over a period from 2009 to 2010, the annual energy consumption increased 5.6 percent, while the annual cost of energy increased 38.2 percent. In order to maintain reasonable energy prices for consumers, the government subsidizes the costs of commodities such as crude oil, which levels out prices for the end consumer. However, this policy results in the government's absorbing the rising costs of energy, putting a strain on the developing country's budget.

These energy constraints and challenges have pushed the government to evaluate how the country produces and uses energy. Energy policy was restructured with a series of energy laws passed between 2007 and 2009. These laws made the mission of the Ministry of Energy, Mines, Water, and Environment to diversify energy sources, improve energy security, and lead in energy integration with European and Mediterranean markets.

Wind power, hydropower, and solar energy potentials are high in Morocco. Morocco could significantly increase its electricity-generation capacity with the appropriate policy framework, financing mechanisms, knowledge transfer, and infrastructure development. For example, a major change in Morocco's energy policy leading to more power generation is the liberalization of the electricity market. The state-owned power company, the Office National de l'Électricité (ONE), traditionally controlled the electrical sector. Although ONE continues to have sole responsibility for distribution and transmission of electricity, the generation is open for the private sector. Liberalization of the energy economy is therefore leading to

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A solar panel installed on top of a Moroccan roof. Solar photovoltaic (PV) kits were distributed to about 10 percent of the rural population by the Programme d'Électrification Rurale Global.

## ▷ Morocco's Rural Electrification Program

Morocco is beginning to be seen as an energy leader across the African Maghreb region because of its successful rural electrification program. In 1996, the Moroccan government implemented a social program named Programme d'Électrification Rurale Global (the Global Rural Electrification Program, or PERG), which aims to provide electricity to all Moroccans. In about a decade, Morocco increased its rural population's access to electricity from 18 percent in 1995 to 98 percent in 2007. This development has had numerous social and economic benefits, including a reduction in rural-to-urban migration, improved indoor air quality, higher productivity of rural populations, and the introduction of communication devices such as phones and radios.

In some cases, the low population densities and remoteness of villages in rural Morocco made a conventional electric distribution network uneconomical. This constraint led PERG to use distributed power generation to bring electricity to approximately 10 percent of rural Moroccans by equipping them with individual solar photovoltaic (PV) kits.

more private-sector investment and a growth in renewable energies.

Projects under development will increase the share of renewable electricity from 10 percent in 2007 to 42 percent installed capacity by 2020. This increase will come from developing solar, wind, and hydroelectricity. In 2009, Morocco announced multiple concentrated solar energy projects that, when completed in 2020, will account for 38 percent of north African–installed renewable power generation capacity and will produce 2,000 megawatts across five sites throughout Morocco. The expansion of wind farms throughout the country will also result in an additional 2,000 megawatts

by 2020. Most of Morocco has good wind potential, with many places having 32-feet-per-second (10-meter-per-second) or higher prevailing winds, making the country attractive for development.

### Energy Integration

Energy integration is a high priority for Morocco, which is working on integrating the Moroccan grid with European and Mediterranean markets. As of 2010, Morocco was the only country in Africa with an electrical grid connected to Europe. The ambitious plan to develop green power will result in a surplus of renewable energies, which Morocco can sell in other markets that have less potential for the development of clean energy. Given Europe's land constraints, importing renewable energy from North Africa will be necessary if Europe is to reach the goal of having 100 percent of its electricity generated by renewable sources by 2050. Morocco is capitalizing on this and attracting foreign investment through expansion of energy integration between Morocco and Europe.

The urban market for distributed energy generation is rising in Morocco as well, with the growing adoptions of solar thermal and solar photovoltaic systems. Most thermal energy demands are met through liquefied petroleum gas (LPG), which is distributed through portable canisters given the lack of infrastructure supporting gas service lines. Morocco is poised to leapfrog across gas technologies, however, with an increasing demand in solar thermal installations on rooftops. The popularity of solar thermal power is spreading with the public's perception of this energy source as a safer and more economical alternative to more traditional sources.

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### Further Reading

- Central Intelligence Agency. "Morocco." In *The World Factbook*. <https://www.cia.gov/library/publications/the-world-factbook/geos/mo.html>.
- Clery, D. "Sending African Sunlight to Europe, Special Delivery." *Science* 329, no. 5993 (August 13, 2010).