IEA GEOTHERMAL

Mexico Country Report
2012

IEA Geothermal
Implementing Agreement

National Activities

Chapter 16 of Draft 2012 GIA Annual Report

Mexico

Los Humeros field, Mexico.
(Photo courtesy of Rosa María Barragán)

16.0 Introduction and Overview

Geothermal and wind are the most important non-conventional renewable energy sources utilized in Mexico. Although there is some tradition for direct uses of geothermal energy, mainly related to balneology, the most important use is for electricity generation.

Geothermal development for electricity generation started in Mexico in 1959, with the commissioning of the first commercial plant in the Pathé field (central Mexico) that was in operation up to 1973. That year the first geothermal power plants in the Cerro Prieto geothermal field started to operate. By December 2012 the geothermal-based installed capacity for electricity generation was 958 MW_e, and the running capacity was 805 MW_e.

Key statistics related to power generation with geothermal energy in Mexico for 2012 are shown in Table 16.1.

During 2012 there were 222 production wells and 29 injection wells in the four operating fields, on average.

These wells were distributed as follows. Cerro Prieto: 160 production and 18 injection, Los Azufres: 37 production and 6 injection, Los Humeros 22 production and 3 injection, and Las Tres Vírgenes: 3 production and 2 injection.

There is no comparable tradition for direct uses of geothermal energy in Mexico; the most recent estimate places at 156 MW_{th} the direct utilization of geothermal heat, mainly for balneology. The number of sites utilizing geothermal heat for balneology is around 165, distributed in 19 states.

16.1 Highlights and Achievements

In the Los Humeros geothermal field one new 25 MW_e condensing (flash) unit was completed by the end of 2012

and started to operate in January 2013. With this unit, the installed capacity in this field reaches 65 MW_e. Other power unit of the same type and capacity is almost finished and it is expected to be commissioned in 2013. In the Los Azufres field the CFE conducted an international bidding to construct and install 50 MW_e. The contract was awarded to a joint venture headed by Mitsubishi Heavy Industries, who started the construction activities in 2013.

Table 16.1 Status of geothermal energy use for electric power generation in Mexico for 2012.

Total Installed capacity (MW_e)	958
Running capacity (MW_e)	805[1]
Generation equipment out of operation, mainly for lack of steam (MW_e)	153
New installed capacity (MW_e)	0
Contribution to National capacity (%)	1.52
Total generation (GWh)	5817
Contribution to National generation (%)	2.24
Target	na[2]
Estimated Country potential (GWe)	2310[3]

[1] 150 MW_e (flash) in Cerro Prieto I and 3 MW_e (binary) in Los Azufres.

[2] There is not a specific target set for geothermal energy. A target of 35% of total installed power generation capacity is set for clean sources by 2024. "Clean sources" are usually understood as those producing little or no greenhouse gas emissions.

[3] Estimated potential from conventional hydrothermal resources with t > 150 °C. Of these 125 correspond to proven, 245 to probable, 75 to measured, 655 to indicated and 1,210 to inferred resources. From Gutiérrez-Negrín, L.C.A. (2012).

16.2 National Programme

About 76.6% of the installed capacity for public-service electricity generation belongs to the government-owned utility, namely the Comisión Federal de Electricidad (CFE). The other 23.4% belongs to private-owned companies that operate combined-cycle and wind power plants and must sell their power to the CFE. CFE has developed and manages all geothermal fields and is responsible for all electricity generated with geothermal steam. This primary energy source has been utilized for decades for power generation; the technology is considered mature for conventional (hydrothermal, high temperature) resources and it is set to compete under the same bases as fossil-fuel, conventional hydro and nuclear technologies.

A target has been set for 2024, when 35% of the electric power generation in the country should come from clean energies. At present several working groups are being set up in order to establish targets by specific technologies.

16.3 Industry Status and Market Development

At present there are no economic incentives for geothermal development in Mexico. As mentioned above, power generation with geothermal energy is considered conventional in Mexico, and thus it is set to compete under the same bases as fossil-fuel, conventional hydro and nuclear technologies. Therefore, it is fair to say that the main constraint for further geothermal development in this country is its economic disadvantage against modern fossil-fuel generation technologies.

An encouraging sign regarding geothermal development in Mexico is the fact that, for the first time, a private investor has carried out exploration and drilling activities. However, no information has been disclosed, presumably because there are unresolved legal issues that prevent the developer from effectively protecting its investment.

16.4 Research, Development, and Demonstration/Deployment

Most geothermal research activities in Mexico are focused on development and exploitation of resources for power generation. Specifically, they are aimed to improve the knowledge of the fields and thus the ability to predict their behaviour under continued exploitation. Some effort is spent in exploration of new areas with geothermal potential. Practically all geothermal research is funded by the federal government, although exploration of a new area has been carried out recently by a private investor.

In 2012 the federal government launched a national bid to create the Mexican Center for Innovation in Geothermal Energy (CEMIE-Geo), which is to be led by a research or higher education institution and composed of private companies, associations and institutions related to geothermal energy in Mexico. Two groups were formed and proposed several projects to be financed by federal investment. The bid was finally declared closed with no official decision, and a new bid has been launched in 2013.

16.5 Geothermal Education

In the past CFE trained some of their engineers through the geothermal programs offered by Iceland (the United Nations University), New Zealand (the Geothermal Institute of the University of Auckland) and the Baja California University (UABC). During the last years CFE has sent young engineers for training to Japan, under an agreement between JICA and the Mexican government. For the most part, mechanical, electrical, chemical and geological engineers are trained on the job, as part of their professional development in CFE and the Instituto de Investigaciones Eléctricas (IIE). Periodic professional

meetings (congresses, seminars, etc.) provide a basis for continued education of geothermal personnel.

16.6 Future Outlook

When the second 25 MW_e power unit of Los Humeros starts to operate commercially, three of the current 8 backpressure units, 5 MW_e each, are planned to be dismantled, and then the new installed capacity in this field will be 75 MW_e. CFE continues working on the development of 25 MW_e in Cerritos Colorados. An additional power unit of 50 MW_e is currently under construction in Los Azufres, and it is scheduled to be commissioned in 2014. The first private geothermal electric project continues its development in the western part of the country, including drilling of three deep exploration wells. No public information has been disclosed. Other exploration activities (MT surveys) are being carried out by other private companies also in the western country.

The price of electricity in Mexico has been subject to gradual upward adjustments to cover for the corresponding increases in the cost of operation of the public power system. This trend is expected to continue. Currently, most power prices to final consumers are subsidized at different levels by the federal government. There are no FiT for geothermal electricity.

16.7 References

Gutiérrez-Negrín, L. C. A. (2012) Update of the geothermal electric potential in Mexico. Geothermal Resources Council Transactions, Vo. 36, pp671-677.

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