

Philippines

Geothermal Energy

Market Overview



May 2021



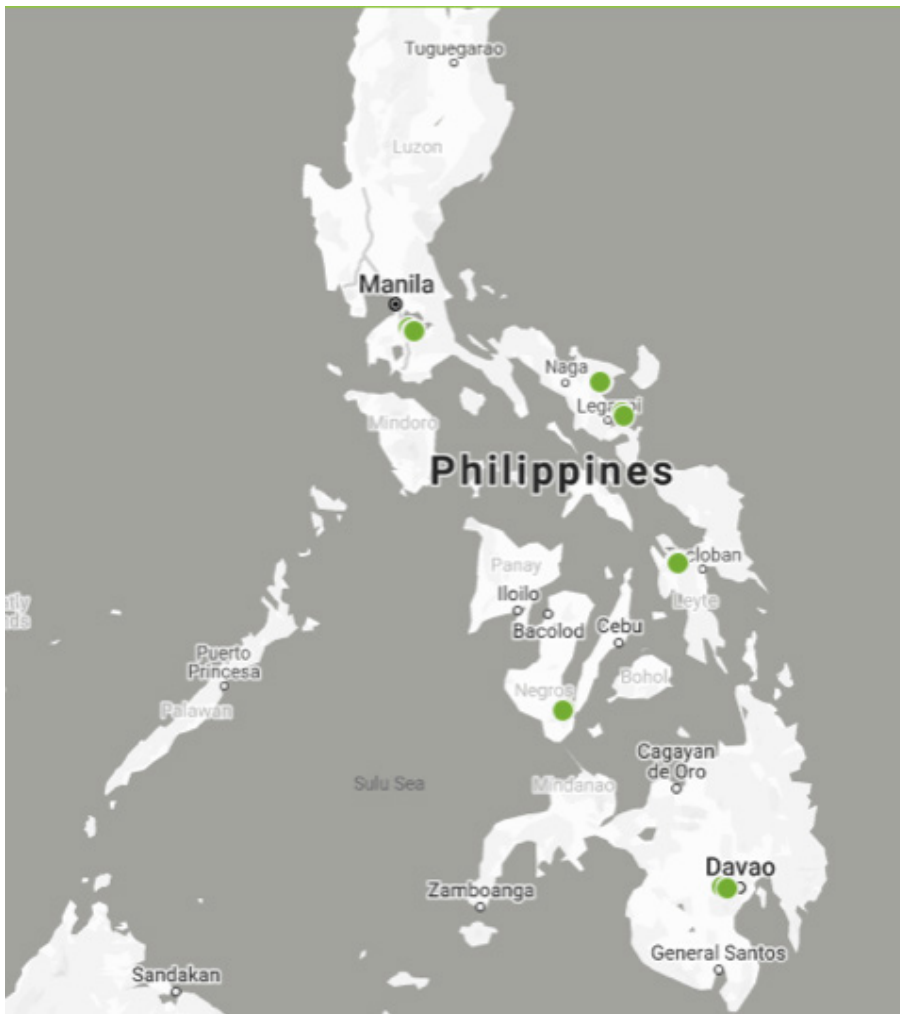
Abstract:

Geothermal development in the Philippines has been going on for more than 50 years with the first pilot plant installed in Tiwi. Currently, the installed geothermal operations are in Tiwi (234 MW), Makiling Banahaw (458.53), Bacon - Manito (140 MW), Tongonan (733.18), Southern Negros (222.5), Mt. Apo (108.48), and Maibarara (32 MW) where the capacity has reached 1928 MW, occupying third spot in the list of the largest geothermal producers in the world. Based on resource estimates, there is 50% of geothermal resources remaining for development. According to the Department of Energy (DOE), there are 32 Geothermal Service Contracts (GSC) that will help increase the supply of electricity and the Government launched 5 geothermal projects to the various stakeholders in early 2021. To support geothermal development in the Philippines, the Government has implemented various regulations, one of which is helping to trace the licensing process for the implementation of geothermal energy projects. With this regulation, it is hoped that the remaining geothermal resources may be realized, more projects will enter and begin commercial operations in the coming years.

Key Facts



- Installed geothermal capacity 1,928 MW
- The Philippines is the 3rd ranked country in terms of geothermal power generation capacity
- Target total additional capacity of 777.6 MW in 2020-2040
- Estimated geothermal potential of around 4,000 MW



The Country's Energy Market

In 2019, the total installed capacity in the Philippines was 25,531 MW of which 25,006 MW or (97.9%) came from the main Luzon, Visayas and Mindanao main grids while 526 MW or 2.1% came from off-grid areas. The largest contribution came from fossil fuels, while renewable energy plants contributed 7399 MW or 29.0% which were dominated by hydropower and geothermal. In 2019, 1674 MW of new capacity was added to the country's supply which includes coal-fired power plants (1559 MW), oil (8 MW), hydropower (31 MW), biomass (52 MW), and solar (25 MW). As of June 2020, the capacity mix is still dominated by fossil fuels. For renewable energy, hydropower contributed the largest portion of 14.6%, geothermal 7.5%, solar 4%, wind 1.7%, and 1.4%. The highest share is in Visayas, followed by Luzon and Mindanao. For the period 2020 to 2022, the country expects to add new capacity of around 4077 MW which comes from coal (2,521 MW), oil (415 MW), natural gas (650 MW), biomass (252 MW) and solar power (240 MW).

Country Overview

The energy mix in the Philippines is dominated by fossil fuels, such as coal, natural gas and oil, which contribute 73.5 percent of the country's total energy needs. The impact of climate change in the Philippines makes renewable energy the main option for energy sources. As the Philippines is located along the Ring of Fire, this country has promising geothermal potential for the future and is suitable for geothermal development. Recently, the Philippines is the 3rd largest geothermal electricity producer in the world, but geothermal development in the Philippines has been less rapid lately. In 2019, there was only an additional 12 MW from the Maibarara Unit 2 Power Plant, thus increasing the geothermal capacity to 1918 MW. There was also a 10.5 MW additional capacity from the completion of rehabilitation of Tongonan I power plant, resulting in the increase of geothermal capacity from 112.5 to 123 MW. This increased the geothermal capacity from 1918 MW to 1928 MW. The Department of Energy (DOE) of the Philippine has additional capacity targets: 183 MW in the short-term (2016-2020), 900 MW in the medium-term (2021-2025), and 288 MW in the long-term (2026-2030). By 2030, the total objective to be reached is 1,371 MW in added capacity.

Geothermal resources and potential

A map of the location of the Philippines' geothermal distribution shows that the country has attractive geothermal resources to exploit. There are about 136 geothermal areas with low to



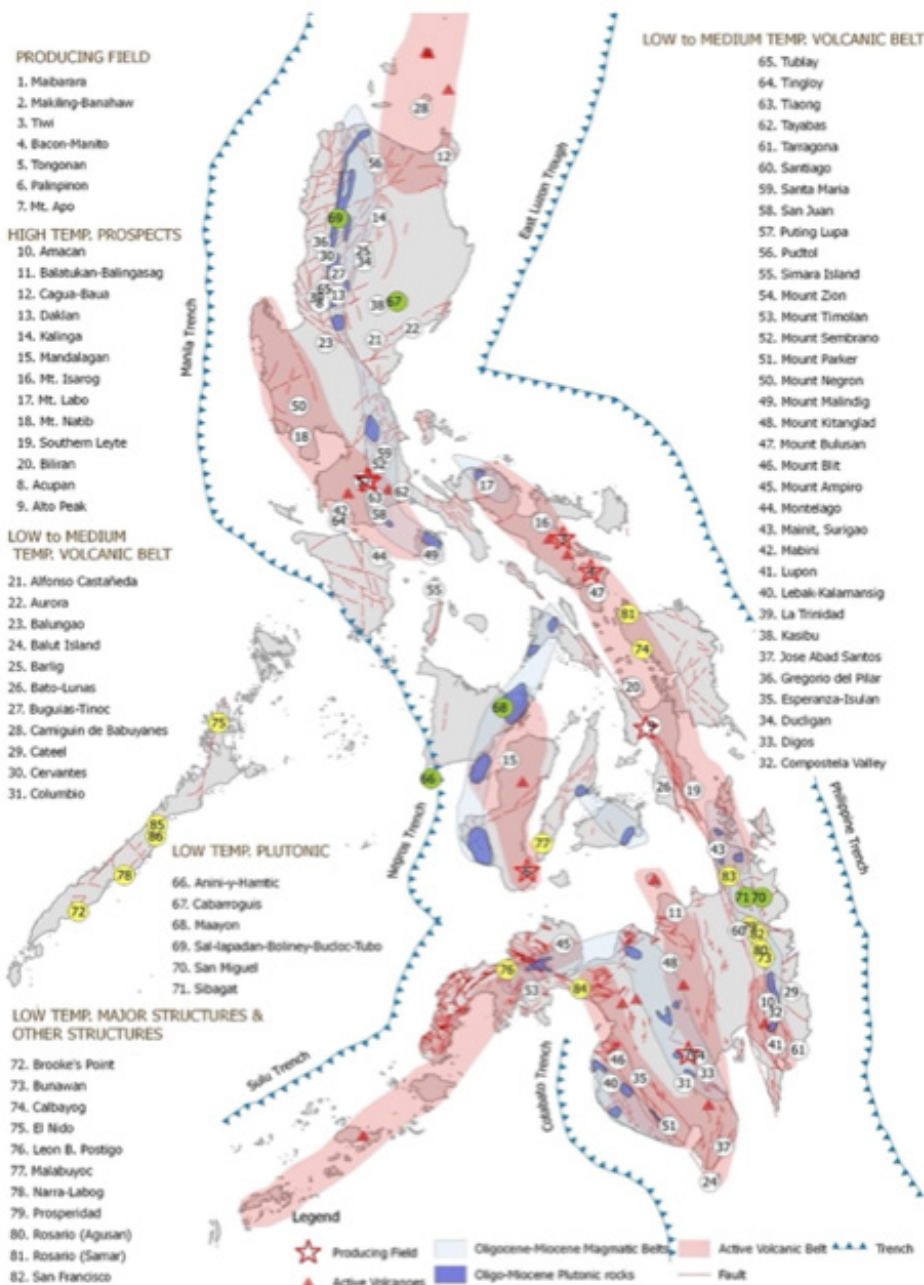
high temperatures where 95 geothermal areas are open for development. From the updated Monte Carlo simulation, the best estimate for the Philippines' geothermal resources is 2,152 MWe (P50), while the P90 result is 1,028 MWe and P10 is 4,064 MWe.

Regulatory framework

The renewable energy laws, rules and regulations in the Philippines are governed by the DOE. Renewable energy act is regulated in Republic Act (RA) No. 9513, an act promoting the development, utilisation and commercialisation of renewable energy resources and for other purposes. In 2008, RA No.9513 was enacted to accelerate exploration and development of renewable energy resources. This law was enacted to achieve energy self-reliance and reduce the coun-

try's dependence on fossil fuels. DOE also established the Green Energy Option Program in 2018 through the Department Circular No. 2018-07-0019 which aims to empower end-users with additional options by providing renewable energy as an additional source for their energy needs. In addition, DOE issued regulations regarding Renewable Portfolio Standards (RPS) for the growth of the renewable energy industry in off-grid and missionary areas through the Department Circular No. 2018-08-0024. Further, DOE issued Department Circular No. 2018-09-0027 to further intensify the planning process and strengthen the implementation of various development plans including renewable energy in the distribution and transmission of energy.

In order to tackle the challenges in the development of geothermal resources, the Government imposed Executive Order No. 30 (the Energy Projects of National Significance - EPNS) to streamline the process for permits acquisition, RA No. 11032 (the Ease of Doing Business and Efficient Government Service Delivery Act of 2018) to shorten the transaction periods for permit acquisition, and RA 11234 (the Energy Virtual One-Stop Shop - EVOSS) as an online platform for developers to apply and monitor the acquisition of permits. With the challenges in the exploration, particularly in permitting of geothermal energy, the policy in the Philippines is now regulating 7 years of exploration stage / pre-development stage, instead of 5 years.





Geothermal Energy Utilisation today

Most of the geothermal utilisation in the Philippines is for generating electricity. The following are areas with installed geothermal power plants: Tiwi (234 MW), Makiling Banahaw (458.53), Bacon - Manito (140 MW), Tongonan (733.18), Southern Negros (222.5), Mt. Apo (108.48), and Maibarara (32 MW). The Philippines has also utilised geothermal energy for direct use. So far, there have been 2 plant drying facilities with a total installed heat capacity of 1.63 MWt with an annual energy use of 17.34 TJ / year at the Palinpinon Agro-Industrial Plant and 9.59 TJ / year at the Manito Lowland Drying Plant. However, these two facilities stopped operating in 1997 and 1998. For this reason, the government continues to conduct research to develop direct utilisation in the Philippines.

Geothermal Market & Industry

The geothermal program in the Philippines was started in 1962 where the Philippines Commission investigated the capability of the Philippines to produce geothermal energy. This was supported by the geothermal law (RA 5092) in 1967. In 1969, the Philippines Institute of Volcanology successfully installed a 2.5 kW non-condensing geothermal pilot plant in the Tiwi geothermal area. Geothermal exploration and exploitation activities became very active in 1976-1984 and produced 425 MW of Makiling Banahaw, 330 MW Tiwi, 112.5 MW Tongonan 1, and 112.5 MW Palinpinon 1. This achievement was done by two government owned and controlled corporations, namely the Philippine Geothermal Inc. (PGI) and PNOG Energy Development Corporation (PNOG EDC), which are actively developing to achieve the government's geothermal program. The power plant operators are NPC, CalEnergy / Ormat, Calenergy, and Marubeni. Since 1984, the Philippines has succeeded in becoming the 2nd largest geothermal producer in the world. After that, the Philippines continued geothermal development, so that 588 MW Leyte, 150 MW Bacman, 106 MW Mindanao, and 80 MW Palinpinon II were successfully installed.

In 2020, the DOE stated that the Philippines will allow 100% foreign ownership for large-scale exploration, development and utilisation in geothermal projects. The initial investment cost of the large-scale projects referred to is USD 50 million capitalisation through Financial and Technical Assistance Agreements (FTAAs) whereby an FTAA can be made between a foreign contractor and the Philippines government, signed by the President. Another program to drive geo-

thermal energy is Green Energy Options, which is a program that provides options for end-users to choose renewable energy sources as their energy source. Several other incentive programs that are expected to attract investors are Income Tax Holiday (ITH), ten-year duty-free Importation of renewable energy machinery, equipment and materials, 100% Tax credit on domestic capital equipment and services, seven-year net operating loss carry-over, and more.

Current Project Development

To accelerate the development of renewable energy in the Philippines, the Government launched five geothermal projects to the various stakeholders in early 2021. These projects are Daklan Geothermal Project (27 MW), Itogon Geothermal Project (9 MW), Puting Lupa Geothermal Project (17 MW), Maricaban Island Geothermal Project (4 MW), and Mt. Labo Geothermal Project (30 MW). In 2020, the DOE approved the additional investment for the expansion of the Palayan Binary and Tanawon in Bacman.

According to the Philippine Energy Plan 2016-2030 report by the DOE, to increase the supply of electricity from renewable energy, there are 32 Geothermal Service Contracts (GSC)/operating contracts which will later increase the capacity of renewable energy. As of September 2020,



18 GSC are under pre-development stage where some GSC have completed the 3G survey and some have completed slim hole exploration well drilling. From the 32 GSC, 12 GSC are in the operational stage and 2 GSC (Montelago Geothermal Project and Biliran Geothermal Project) are for the development which are already declared commercial. Currently, the DOE is focusing on an inventory and assessment of geothermal energy sources, to then be offered to the private sector for investment.

Recently, the Philippines is in the stage of developing further geothermal direct utilisation. The Department of Energy (DOE) is identifying geothermal potential for direct use through the “Philippine Geothermal Resource Inventory and Assessment” project. The DOE has also carried out a utilisation plan from the foothills of Mount Makiling in Laguna. The “Philippine Geothermal Resource Inventory and Assessment” has been going since 2017 to 2021. Currently, the project has completed the first phase, which is a geological and geochemical survey on the 6 geothermal prospect areas and the DOE chose to continue the second phase for the MT survey in 2 areas, Mt. Sembrano, Rizal and Buguias-Tinoc, Benguet.

Outlook

In 2021 to 2026, the Philippines plans the addition of 91 MW of geothermal power generation capacity. There are 19 prospective locations that are currently in the exploration stage. In 2020, the DOE was drafting the 2020 – 2040 NREP targets and proposing additional capacity of 777.6 MW based on the awarded contracts. To support the development, the geothermal developer and operator, EDC, invested in the development of three additional geothermal plants, the 29-MW Palayan Bayan in the Bacon-Manito geothermal field, 3.6-MW Mindanao 3 binary plants in the Mount Apo geothermal field, and the 20-MW Tanawon geothermal plant. The changes to foreign ownership are set up to attract additional interest in investment and developments and can push for further development.

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