Indonesia

Geothermal Energy Market Overview

May 2021

Abstract:

Indonesia is a country that has a natural wealth of various natural resources which become a source of energy for the Indonesian people. One of the renewable energies being developed is geothermal. To date, the geothermal power plant that has been installed in Indonesia has reached 2130.7 MW and has since put Indonesia as the second largest geothermal energy producer in the world after the United States. This number is still far from the total estimated geothermal potential in Indonesia, which is 23,965.5 MW. Therefore, geothermal development activities in Indonesia continue and are supported by the government with various programs and regulations that can advance geothermal development. One of the government programs carried out in 2020-2024 is government drilling where the government will conduct exploration drilling with a total potential resource reaching 1844 MW and a development plan reaching 683 MW in 20 geothermal working areas. Most of the geothermal development in Indonesia is focused on indirect utilisation for generating electricity. Several private and state-owned companies are in the process of reaching the maximum potential of geothermal in Indonesia. A total capacity of 196 MW is targeted to be installed in 2021 and a total capacity of 7241.5 MW is targeted by 2025.

Key Facts

- Installed geothermal capacity 2130.7 MW
- Indonesia is the 2nd ranked country in terms of geothermal power generation capacity
- Geothermal resource potential estimated at 23,965.5 MW
- Target total capacity of 7,241.5 MW by 2025

Country Overview

Geographically, Indonesia is located in an area where the ring of fire passes. The country is rich in natural resource potential and has utilised a variety of fossil fuels, such as oil, coal, natural gas, as well as various kinds of renewable energies, one of which is geothermal potential which is a guarantee of energy availability in the future.

Geothermal development in Indonesia is carried out in the following defined stages: Preliminary Survey (Preliminary Survey Assignment / Preliminary Survey and Exploration Assignment), Determination and Auction of Geothermal Working Areas, Exploration, Feasibility Study, Exploitation and Utilisation.

Currently the utilisation of geothermal energy is still relatively low compared to that of fossil energy. Power generation from renewable energy sources currently only reaches 7.7% of the total national energy mix. Renewable energy is targeted to contribute 23% or the equivalent of 45 GW in installed power generation capacity in 2025, where geothermal is expected to contribute 7,241.5 MW. The target for renewable energy in 2050 is 31%, or the equivalent of 169 GW, where geothermal has a target of 17,546 MW at an affordable price for electricity customers. This is in line with the statement of the President of the Republic of Indonesia in the Conference of Parties (COP) 21 in Paris. Indonesia is committed to reducing greenhouse gas emissions by 29% by 2030, one of which is through accelerating the development of renewable energy.

The Country's Energy Market

As the fourth most populous country in the world, Indonesia plays a significant role as a producer and consumer of energy. Primary energy in Indonesia consists of petroleum, natural gas, coal and renewable energy. Total energy production in Indonesia reached 411.6 MTOE in 2018. Indonesia also plays a role in energy exports and imports where energy exports, especially coal and LNG account for 64% or 261.4 MTOE of total production, while energy imports are 43.2 MTOE, mainly crude oil, fuel products, and a small portion of high calorie coal to meet the needs of the industrial sector. Most of the renewable energy is used for electricity generation and the rest for the

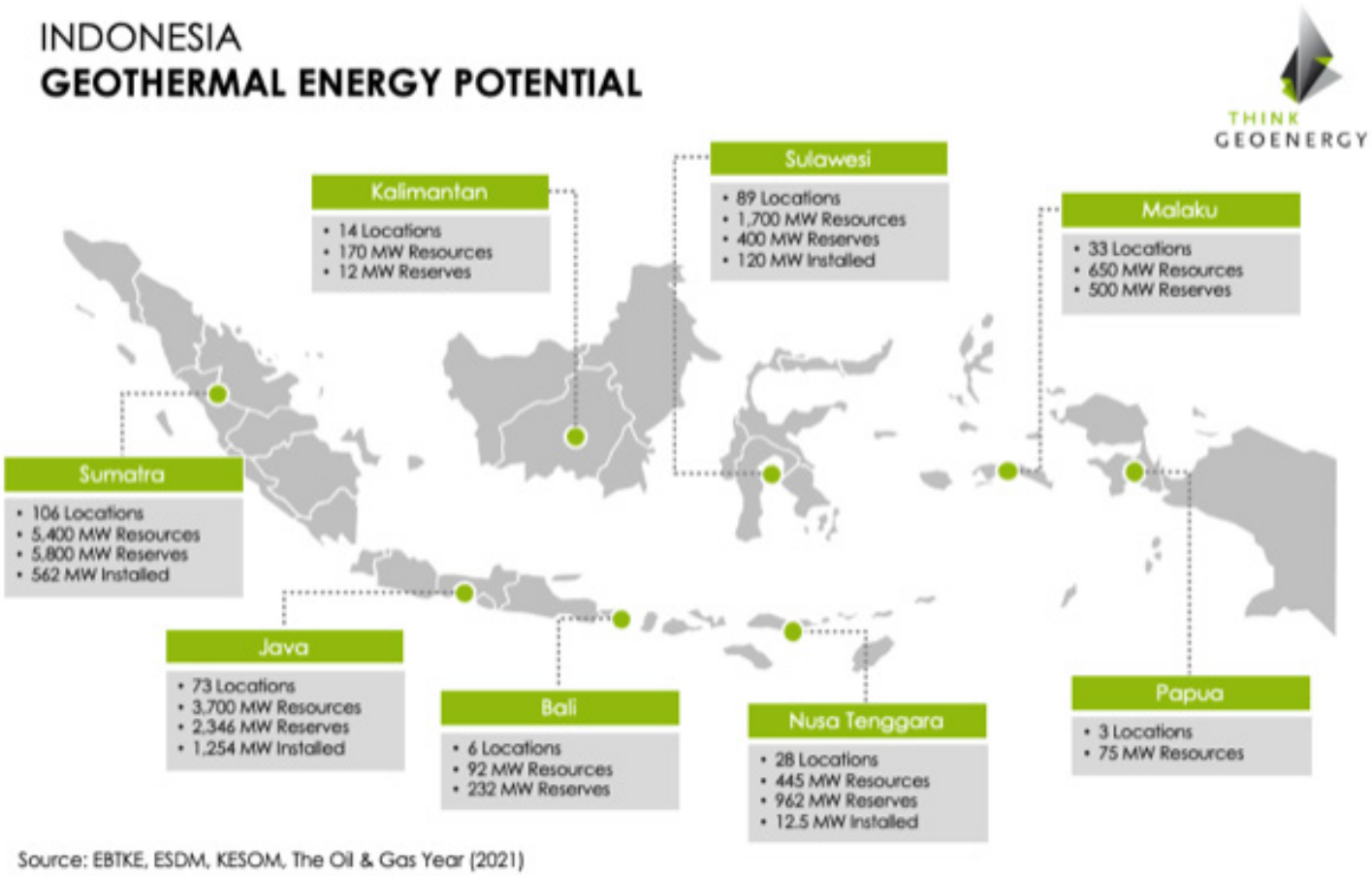
transportation, industrial, commercial and other sectors as raw material for a mixture of biodiesel and bioethanol. Total final energy consumption (without traditional biomass) in 2018 is around 114 MTOE consisting of the transportation sector 40%, then industry 36%, households 16%, commercial 6% and other sectors 2%.

The national final energy demand in 2025 is dominated by the transportation sector and in 2050 it is dominated by the industrial sector. Electricity demand until 2050 is dominated by the household sector, then the industrial and commercial sectors.

In 2020, the total power generation capacity in Indonesia is 63,728.71 MW. More than half of the installed power generation capacity is represented by fossil fuels, with coal fired power plants representing more than half of the installed power generation capacity of Indonesia. Renewable energy capacity represents around 14% of the total installed capacity with hydropower plants leading with a capacity of 4,621 MW, followed by geothermal with 2,130 MW.

Geothermal Resources and Potential

Based on data from the Ministry of Energy and Mineral Resources in Indonesia, the potential for geothermal resources in Indonesia reaches 23,965.5 MW, located in 357 locations across the islands of Sumatra, Java, Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku and Papua. The total estimated reserve of geothermal resources in all provinces in Indonesia is 1875.7 MW, while the proven reserve is 3,054.8 MW. Based on the province, the proven reserve for Sumatra is 1,070.3 MW, Java 1820 MW, Bali and Nusa Tenggara 42.5 MW, Sulawesi 120 MW, and Maluku and Papua 2 MW. Based on geothermal resources, the projects planned for high enthalpy resources (225 °C) are 168 projects with a total of 6896.5 MW, while the medium enthalpy resource is planned to have 52 projects with a total of 1157 MW. Based on the target schedule of Commercial Operation Date (COD), there are 48 projects for a total of 1522.5 MW planned for the short term (2019-2024), 126 projects for a total of 5131 MW planned for the midterm (2025-2028), and 46 projects for a total of 1400 MW planned for the long term (2029-2030).



Regulatory framework

The reference for determining geothermal working areas is MEMR Regulation No. 37 year 2017 regarding geothermal working area for indirect use. The other main law that is applicable to geothermal in Indonesia is Law No. 21 year 2014. This law regulates that permit, tendering, control and supervision of the geothermal business and development are fully under the authorisation of the central government. In geothermal development activities, the government has the right to carry out exploration, exploitation and utilisation by designating a state-owned enterprise and/or Public Service Agency. For geothermal utilisation, indirect use is fully managed by the central government, while direct use is managed by the local government. This law also discusses the production bonus that must be submitted to the local government based on the percentage of gross income.

Geothermal Energy Utilisation today

The use of geothermal energy in Indonesia is divided into two, namely direct use and indirect use. The biggest use is for indirect use, which is to generate electricity. Historically, geothermal development in Indonesia began in 1918 and the first geothermal exploration started in 1925. So far, geothermal energy in Indonesia has been generally developed in the form of indirect use, namely the use of geothermal energy to generate electricity. In 1981 development in Kamojang took place and the geothermal power plant operation in Kamojang took place in 1983 with a capacity of 30 MW, followed by 2x55 MW in 1988. From 1983-1999 the total capacity became 574 MW. This geothermal development is triggered by the Presidential Decree which allows geothermal development companies to sell steam to the state-owned electricity company in Indonesia. In 2000-2010, the total capacity was 722 MW. Then the total capacity will increase in 2011-2020, which is 834.7 MW. Based on the EBTKE update by February 2021, the total realised capacity is 2,130.7 MW which makes Indonesia the second largest country producing geothermal in the world. The geothermal power plants are located in 13 locations, across the islands of Sumatra, Java, Nusa Tenggara and Sulawesi. The following are areas with installed geothermal power plants: Sibayak (12 MW), Salak (376.8 MW), Wayang Windu (227 MW), Patuha (55 MW), Kamojang (235 MW), Darajat (270 MW), Dieng (60 MW), Lahendong (120 MW), Ulubelu (220 MW), Ulumbu (10 MW), Mataloko (2.5 MW), Sarulla (330 MW), Karaha (30 MW), Lumut Balai (55 MW), Sorik Marapi (42.4 MW), and Muara Laboh (85 MW).

Geothermal Market & Industry

Indonesia has several geothermal developers, both state-owned and private. Star Energy Geothermal is the company with the largest installed capacity of 873.8 MW, followed by Pertamina Geothermal Energy with 672 MW of installed capacity. Installed capacity owned by Sarulla Operation Ltd is 330 MW. PT Geo Dipa Energi, the state-owned enterprise, has two power plants with installed capacity of 115 MW. In addition, there is PT Supreme Energy with an installed capacity of 85 MW, PT Sorik Marapi Geothermal Power 42.4 MW and PT PLN (Persero) 12.5 MW.

Setting the tariff or selling price of electricity generated by geothermal power plants is the most important key to optimising geothermal development. PT PLN (Persero), the national power company in Indonesia, is the primary off-taker for electricity from geothermal energy in Indonesia. So far, the purchase of electricity from a geothermal power plant is valued based on the basic cost of local supply. However, geothermal developers expect that the electricity purchase rate of PT PLN (Persero) to geothermal power plant developers is more attractive.

To accelerate the geothermal development, the government has determined the ceiling tariff which is stated in the MEMR Regulation No. 17 year 2014. In this regulation, the ceiling tariff is determined based on region and year of COD. Then, in 2017 the government revised the structure of the feed in tariff and

standard PPA as stated in MEMR decree No. 50 year 2017 regarding renewable energy tariffs. This decree aims to ensure certainty in the renewable energy business scheme. The tariff scheme will apply to new and existing geothermal developments.

One of the things that is also discussed in this decree is the Built, Own, Operate and Transfer (BOOT) system which is introduced after 30 years of the PPA is finished. Currently, the government is preparing a Presidential Decree on Renewable Energy Development which covers all renewable energy development and tariffs for geothermal.

For funding, one of the programs of the Government of Indonesia is the Geothermal Fund with funding sources from the State Budget and World Bank grants. This program is to facilitate financing of geothermal exploration through the Geothermal Energy Upstream Development Project (GEUDP) and Geothermal Resource Risk Mitigation (GREM).

Current Project Development

In 2020-2024, the government will carry out exploration drilling or government drilling in 20 geothermal working areas in Indonesia with a total potential resource of up to 1844 MW and a development plan of up to 683 MW. Government drilling is one of the government's strategies to accelerate geothermal development and improve the quality of geothermal working area data before being offered to business entities through a tender process. With the existence of government drilling, the risk factor for failure in exploration is borne by the government.

In addition, the government is also carrying out the Flores Geothermal program which is the fulfilment of the basic electricity load and the optimisation of direct use of geothermal energy on the island of Flores. Another development project being carried out is the addition of an installed capacity of 196 MW in 2021. This addition was carried out by PT Sokoria Geothermal Indonesia, PT Supreme Energy, and PT Geo Dipa Energi in East Nusa Tenggara, North Sumatra, South Sumatra and Central Java.

Outlook

In 2020, the Indonesian government together with the Indonesian Geothermal Association will draft a Presidential Regulation which will regulate new tariffs for geothermal plants. The regulation is expected to attract investors and help investors to get profits according to the investment risk carried by the developer.

Although geothermal development requires expensive and time-consuming investment and exploration costs, Indonesia continues to strive for geothermal energy development to reach the target of 7,241.5 MW by 2025 and become the largest producer in the world. This development requires support in terms of regulations as well as investment.

Sources

Country Update Report for Indonesia, World Geothermal Congress 2020
Pengembangan Panas Bumi Indonesia by Direktorat Panas Bumi, EBTKE, Indonesia, February 2021 [in Bahasa Indonesia]
Handbook of Energy & Economic Statistics of Indonesia 2019 (ESDM)
Title picture: Mount Bromo, Java, Indonesia (source: flickr/ sara marlowe, creative commons)