

## **Geothermal in Indonesia**



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Power expansion has been massively targeted by at least last two President regimes, SBY with his two editions of 10,000 MW and Joko Widodo with his 35,000 MW. Among the programs, one of the concerns is the renewable energy especially geothermal. Indonesian geothermal has just developed faster, raising hopes for the future. With approximately 23 GW resources, Indonesia would one day become a geothermal superpower country. And today, although it remains unnoticed, Indonesian geothermal leads at the forefront. Facing the years ahead, Indonesia even poses a possibility to become the largest geothermal user in the world.

At the end of 2020, global installed geothermal power capacity in 10 top geothermal user countries reached 15.3 GW or 13% of the total global geothermal resources. At the same time, Indonesia has installed 2,130 MW from 16 projects or accounts to 9% of its total national resources. Slow but sure, Indonesia now is the 2<sup>nd</sup> largest geothermal user in the world after the United States (US) (3,676 MW), surpassed Philippines (1,918 MW) in the 3<sup>rd</sup> position. Among the top-rank geothermal users, only Indonesia that has a significant and continuous rising energy demand which makes room for further geothermal expansion widely open. By 2021, it is expected that some new projects will reach commercial operation date including Sorik Marapi Unit-2 (45MW), Sokoria Unit-1 (5 MW), Rantau Dedap Unit-1 (90 MW), and Dieng small-scale (10 MW), those will add the capacity of operating plant in Indonesia.

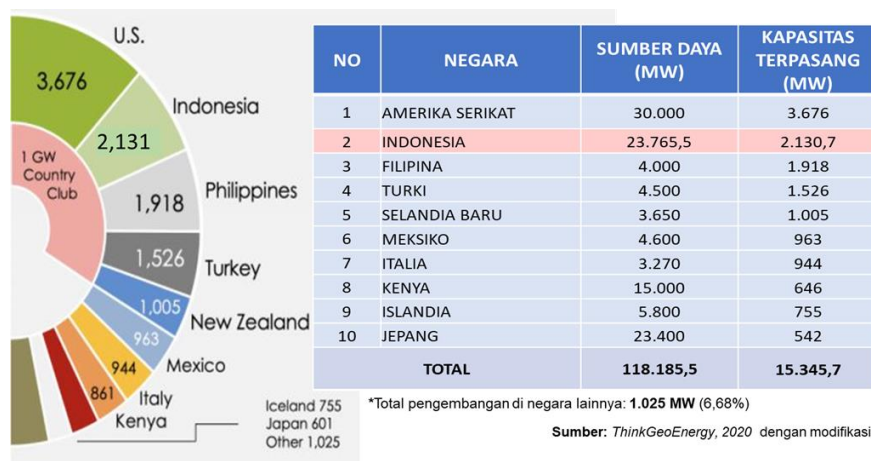


Fig. 1 Global Installed Geothermal Power Capacity

Next, the Government's big agenda on geothermal development under the State-owned enterprise Ministry (MOSoE) and Ministry of Finance (MoF) is also to establish geothermal holding company which will merge all State-owned enterprise in geothermal sector under 1 (one) holding company. Geothermal SOE holding will be listed on the Indonesia Stock Exchange. Mobilization of funds and optimization of assets, technology, and human resources are expected to be easier to realize with the existence of this joint SOE geothermal

**– Main regulatory support on license and pricing**

Currently the tariff stipulation for geothermal remains belong to the MEMR Regulation No. 50/2017 and its amendments which generally setting out the tariff at 85% PLN's electricity generation cost in project areas. For some projects, especially in Java, some projects can be perhaps less feasible thus a B2B negotiation is still enabled via the regulation although at the ends it shall come up to the PLN's decision.

With regards to geothermal license, aside of geothermal license or *Izin Panas Bumi* (IPB), the MEMR issued the Preliminary Survey and Exploration Assignment (PSPE) license which is defined as an explorations study completed with at least 3 exploratory wells, for business entities/IPPs. Compare to the current market precedent which generally requires any IPP to compete on an open-tender basis to obtain the Geothermal Permit, the PSPE regulation seems would like to filter only IPPs have huge seriousness in geothermal to participate and streamline administration procedures in obtaining the permit. The IPPs who perform PSPE shall be given privileges to be the first rank when a working area is tendered. The Minister is also has right to direct-appoint the IPPs in certain term and conditions.

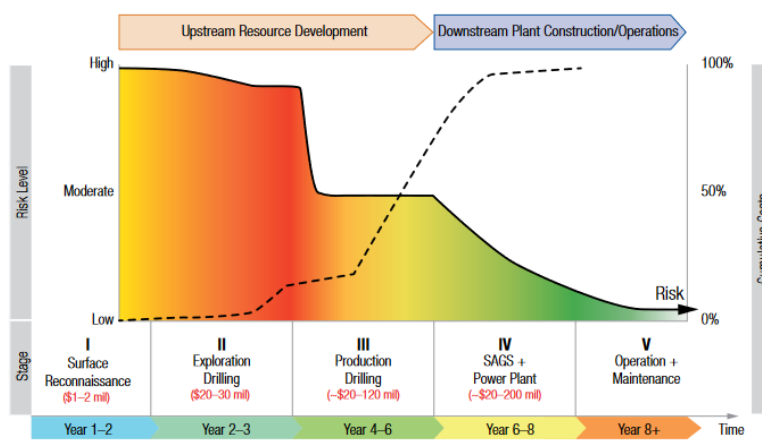
Nevertheless, pricing and certainty of electricity purchase remain issue in geothermal thus some policy measures should be taken to address this problem. The policy that can ensure that developer/investor will get certainty of purchase while at PLN side, the tariff should also remain fine and fair for long-term contract without burned PLN's corporate budget. Government has discussed a Presidential Regulation for renewable energy tariff, which also allows the Ministry of Finance to provide subsidy for renewables, yet this remains unclear to date.

#### **– Government support on resource risk mitigation of exploration stage**

It is very well-known that geothermal is a high-risk energy investment particularly in regard to the exploration stage which requires long-lead time (varies 2-5 years, depends on but not limited to typical well used, site profile, and also other socio-environmental issues) and millions of Dollars investment (USD 8-10 million/well for typical standard hole). The CAPEX of exploration campaign for three standard hole wells ranges from USD 25-30 million, this stage is a game changer for a geothermal project to decide whether the project is feasible or not for further development. According to the GeothermEX (2010), the success rate of geothermal drilling exploration is only 20-40%, the more drilling well might increase

the success rate, yet the more money should be paid off as well. Exploration drilling generally requires owner's equity or corporate finance, which may not be recovered if the drilling reveals that the resource is not technically sufficient or economically viable for exploitation. Therefore, even though initial costs for exploration drilling are modest compared to the total cost of developing all stages of a geothermal operation, it is the riskiest phase of the operation and funding this initial capital can be challenging for developers. Hence, some risk mitigation instruments are perhaps needed to reduce the drilling and resource risk.

Figure 1 | A Conceptual Representation of Risks and Costs during the Different Stages of a Geothermal Development



Source: Adapted from Geothermal Handbook (ESMAP 2012).

Fig. 2 – Typical risk and cost profile of a geothermal project

Technically some optional solutions to be considered in order to mitigate the exploration resource risk is by conducting slim hole drilling, instead using standard or even big hole drilling (Fig. Y and Fig. Z). Slim hole is a typical smaller size of drilling methodology. Basically, slim hole can be considered if a geothermal field has a relatively blind resource, low permeability, and low temperature data distribution (< 220°C). Slim hole drilling is cheaper compared to other two drilling methods thus slim hole can be used to map the resource more detail hence can reduce the resource risk and increase the confidence level before the developers start to use bigger drilling well.

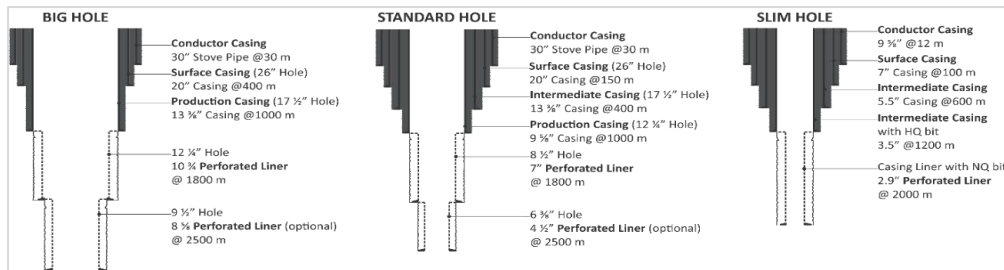


Fig. 3 – Comparison of big, standard, and slim hole drilling

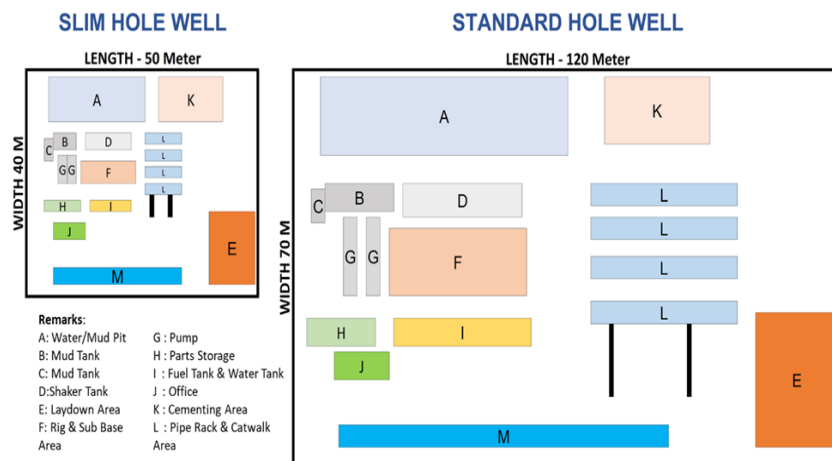


Fig 4 – Comparison of well-pad required for standard and slim hole drilling

Additionally, from regulatory and policy perspectives, the Government of Indonesia via the Ministry of Finance also has formulated series of de-risking mechanism to lower the resource risk. The most notable one is the stipulation and emplacement of IDR 3.1 trillion of revolving Geothermal Fund (or *Dana Pembiayaan Infrastruktur Sektor Panas Bumi* / “PISP Fund”) managed under PT Sarana Multi Infrastruktur (PT SMI) as regulated by the MoF Regulation No. 62/2017 / “PMK 62”. The use of PISP Fund that set out under the PMK 62 are: (i) loan/ financing support on development stage/power generation; (ii) equity investment; (iii) government assignment including exploratory drilling. The PISP Fund can only be accessed by state-owned geothermal enterprises (incl. PT GDE, PT PGE, and PT PLN). Specific to exploration drilling, the PISP can be used for both Government Drilling and SoE Drilling.

Government drilling is aimed at conducting “free-owner” geothermal concession areas (areas that have not been assigned to any business entity by the MEMR) (Fig. A1). In this case, under government assignment, PT SMI undertakes exploration drilling, including

procurement of infrastructure construction and drilling services, on behalf of the government. Once the resources have been confirmed, the sites are tendered by the Geothermal Directorate under the Ministry of Energy and Mineral Resources (MEMR), where the successful bidder for the full development license is required to pay back the costs of drilling plus a premium, so that in the aggregate, the cost of drilling unsuccessful sites is absorbed by the revenues from the successful sites. This window is managed on a portfolio basis under a revolving mechanism, which means that reflows will be used to support future drilling. This scheme is expected to provide a guaranteed and assured exploration study that later could reduce the developer risk. The Government drilling scheme currently has been operationalized in partnership with The World Bank under the Geothermal Upstream Development Program (GEUDP) for two working areas: Wae Sano, NTT and Jailolo, North Maluku. In this program, PT SMI acts as the implementing agency. GEUDP is capitalized with USD 49 million from the PISP Fund as well as a matching USD 49 million from the Clean Technology Fund for and USD 6.25 million grant from the Global Environment Facility for technical assistance and capacity building for PT SMI and relevant stakeholders. PT SMI undertakes exploration drilling, including procurement of infrastructure construction and drilling services, on behalf of the government. Once the resources have been confirmed, the sites are tendered by the Geothermal Directorate under the Ministry of Energy and Mineral Resources (MEMR), where the successful bidder for the full development license is required to pay back the costs of drilling plus a premium, so that in the aggregate, the cost of drilling unsuccessful sites is absorbed by the revenues from the successful sites. This window is managed on a portfolio basis under a revolving mechanism, which means that reflows will be used to support future drilling.

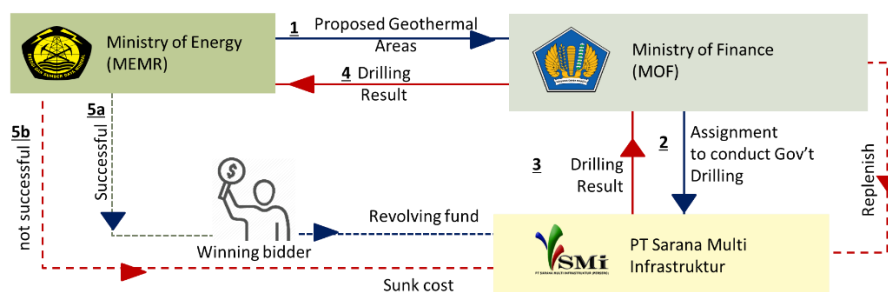


Fig 5 – Government drilling scheme

In addition to Government drilling that targets non-assigned geothermal working areas, the exploration financing facility with de-risking mechanism is also enabled for already-assigned

geothermal areas both for public/SoE and private developers. This window is developed under the *Geothermal Resource Risk Mitigation* (GREM) (Fig A2) under the partnership and cooperation of the Government of Indonesia and The World Bank, in which the fund is managed by PT SMI. There are two schemes i.e., GREM Public Window and GREM Private Window. The first one is designed for public developers such as PT PLN, PT GDE, PT PGE, or affiliated controlled subsidiaries as regulated under the PMK 62. While the second one is for private developers. There is opportunity of de-risking/forgiveness mechanism up to 50% total facility in each window. The approved funding from the Facility for exploration drilling is capped at USD 30 million. In addition, public developers can retroactively apply for funding of 3G/preliminary surveys (limited to a period of 12 months prior to submission of the application) as long as the requirements regarding fulfilment of procurement regulations and environmental and social safeguards are observed. The Phase-1 of GREM is supported via the blending fund of the following:

- Loan
  - o International Bank for Reconstruction and Development (IBRD): USD 150 million
  - o Clean Technology Fund (CTF): USD 40 million
  - o Green Climate Fund (GCF): USD 7.5 million.
- Reimbursable grant / contingent recovery grant for de-risking instrument on private window
  - o GCF: USD 90 million
  - o CTF: USD 32.5 million
- PISP Fund for de-risking instrument on public window
  - o PISP: USD 150 million
- Technical Assistance from Global Infrastructure Facility, GCF, and CTF up to USD 6.25 million.

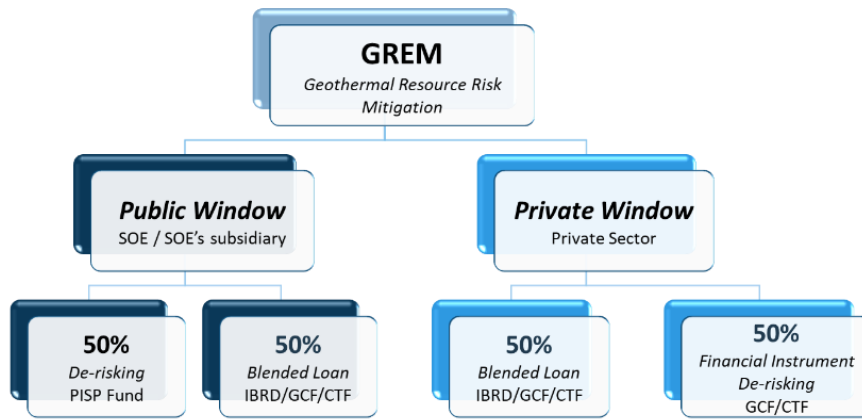


Fig 6 – General scheme of GREM