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The Development of Seulawah Agam Geothermal Working Area Under Indonesia's Geothermal License (IPB) Regulation Era

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ABSTRACT

Seulawah Agam Geothermal Working Area (WKP) is a WKP obtained by PT Pertamina (Persero) through a letter of determination of bidding winner by the Governor of Aceh Province Number 541/53157 in 2013. According to the mandate stated in the Request For Proposal (RFP) document, WKP that has the potential of an estimated 150 MW resources will be developed by the winner of the bidding together with the Aceh Province Regional Development Company (PDPA) in the form of a Joint Venture. The development of WKP in the regulation era of Geothermal License (IPB) as stated in Law No. 21 of 2014 is the first experience for PT Pertamina (Persero) so that in its management it must establish a new entity under the supervision and management of its subsidiary engaged in geothermal development, PT Pertamina Geothermal Energy (PGE). The development of this Seulawah Agam WKP is expected to not only provide added value for PGE but also provide additional Regional Income (PAD) through not only taxes and Non-Tax Income (PNBP), but also from potential production bonuses and potential added value of Aceh Province regional companies for their contribution to the Joint Venture.

1. INTRODUCTION TO SEULAWAH AGAM GEOTHERMAL WORKING AREA (WKP)

Seulawah Agam WKP is determined through Minister of Energy and Mineral Resources Decree No. 1786K / 33 / MEM / 2007 dated 23 May 2007 concerning Determination of Geothermal Working Areas in Seulawah Agam Area, Aceh Besar Regency, Aceh Province. The 45,000 Ha area of WKP has potential reserves of 150 MW with a possible temperature of 225 ° C. WKP land use consists of production forests and other use areas (resident land, rice fields and plantations). Seulawah Agam's geothermal prospects are administratively located in the Seulimum District, Seulawah Valley, Mesjid Raya, and Indrapuri (Figure 1.1). The location can be reached with a distance of about 50 km to the southeast of Banda Aceh.

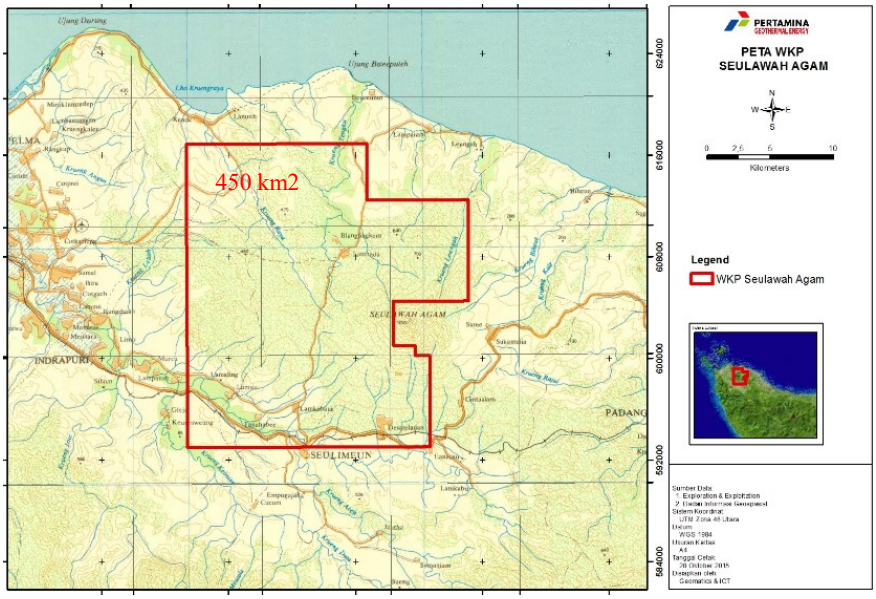


Figure 1.1: Seulawah Agam Geothermal WKP Map

The history of the survey and investigation of geothermal potential in this area began in 1978-1985 by the Directorate of Geology / Volcanology, Ministry of Mining. The investigation was continued by Pertamina from 1990 to 1995.

The chronology of the survey and investigation are as follows:

- 1978: Directorate of Geology, Ministry of Mining investigated the geology of the geothermal area of Seulawah Agam;
- 1981: The Directorate of Volcanology, the Department of Mining conducted a geological and gravity investigation of the geothermal area of Seulawah Agam;

- 1985: Directorate of Volcanology, Ministry of Mines conducted an investigation into the geoelectric resistance of a type of geothermal region Seulawah Agam;
- 1990: Pertamina, Geothermal Division reported on the geochemical reconnaissance of the Aceh region;
- 1993: Pertamina UEP Sumbagut conducted detailed geological surveys and alterations in the area of Mount Seulawah, Aceh Province;
- 1994: Pertamina conducted a combination survey (type, gravity, magnetic and SP detention) of the Mount Seulawah area, Aceh Province;
- 1994: Pertamina publishes a final report on the survey of magnetotelluric (MT-5EX) in the area of Mount Seulawah, Aceh Province;
- 1994: Pertamina conducted an isotope survey of the Sibayak-North Sumatera and Seulawah – Aceh Province;
- 1995: Pertamina conducted a hydrogeological survey of the Seulawah area, Aceh Province;
- 1995: Pertamina conducted shallow drilling and temperature increments in the area of Mount Seulawah- Mount Lamteuba, Aceh Province;
- 1995: Pertamina published the final report on the magnetoteluric (MT-5EX) survey in the Mount Meuh-Lamteuba area, Aceh Province;
- 1995: Pertamina conducted a combination survey (prisoner type, gravity, magnetic and SP) in the area of Mount Meuh-Lamteuba, Aceh Province;
- 1995: Pertamina conducted a Hg & C02 survey and chloride seepage in the Mount Seulawah area, Aceh Province;
- 1996: Pertamina conducted a study of the baseline data on the geothermal prospects of the Mount Seulawah area, Aceh Province.

On December 15, 2010, the Aceh Regional Government opened the registration for the bidding of Seulawah Agam WKP through the auction announcement letter number 01 / PAN-GSA / XII / 2010. PT Pertamina (Persero) then participated in the WKP auction until it was declared to have passed verification and was finally successful as a winner through the Letter of Governor of Aceh No. 541/53157 dated on November 1, 2013.

2. GEOTHERMAL CONCESSION STRUCTURE ACCORDING TO THE GEOTHERMAL LAW NUM. 21 OF 2014

2.1 Legal Basis

The legal basis for the business concession of the WKP Seulawah Agam refers to the Geothermal Law Num. 21 of 2014 which uses Geothermal Permit (IPB). As a comparison, the applicable geothermal exploitation patterns in Indonesia are as follows:

Table 2.1: Comparison of Patterns of Geothermal Concession in Indonesia

No	Description	WKP before UU Num. 27/2003	WKP after UU Num. 27/2003	WKP after UU Num. 21/2014
1	Concession Structure	JOC, ESC, Assignment to Pertamina	• Geothermal Mining Business License / Izin Usaha Pertambangan Panas Bumi (IUP) • Electricity Business License / Izin Usaha Ketenagalistrikan untuk Umum (IUKU)	Geothermal License (IPB)
2	Business Scheme	Total Project and Steamfield Project	Total Project	Total Project
3	Government Income	34% of Net Operating Income (NOI), included all taxes instead of personal tax	Tax and non tax income	Tax and non tax revenue
4	Project Management	Pertamina (JOC) PLN (ESC)	IUP License Holder	IPB License Holder

e.g. Doing Geothermal Business in Indonesia, EBTKE (June 2018)

2.2 State Non-Tax Income

In the Geothermal Law No. 21 year 2014, it was also mentioned that developers are required to pay the state fee (non-tax) in the form of fixed fee and production fee. The stipulated amount is as follows:

- Fixed fees paid in the exploration phase are USD 2 / Ha / year and in the exploitation phase of USD 4 / Ha / year;
- Production fees paid in the commercial phase where steam is 5% of its selling price and electricity is 2.5% of its selling price.

2.3 Producion Bonus

Production bonus is a form of utilization of geothermal development which aims to be directly felt by the producing regions as mandated in the Geothermal Law Number 21 year 2014. The use of this bonus production is prioritized for communities who are closest to geothermal business projects or activities. Benefits of production bonuses include:

- Increasing Regional Original Income as a direct benefit felt by the Regional Government and the community;
- Encouraging the formation of welfare improvement programs in producing regions;
- Encouraging the growth of a sense of belonging to the community towards geothermal projects;
- Creating a conducive synergy between the Government, the community and geothermal developers.

The procedures for amount and granting geothermal production bonuses are stipulated in Government Regulation Number 28 year 2016.

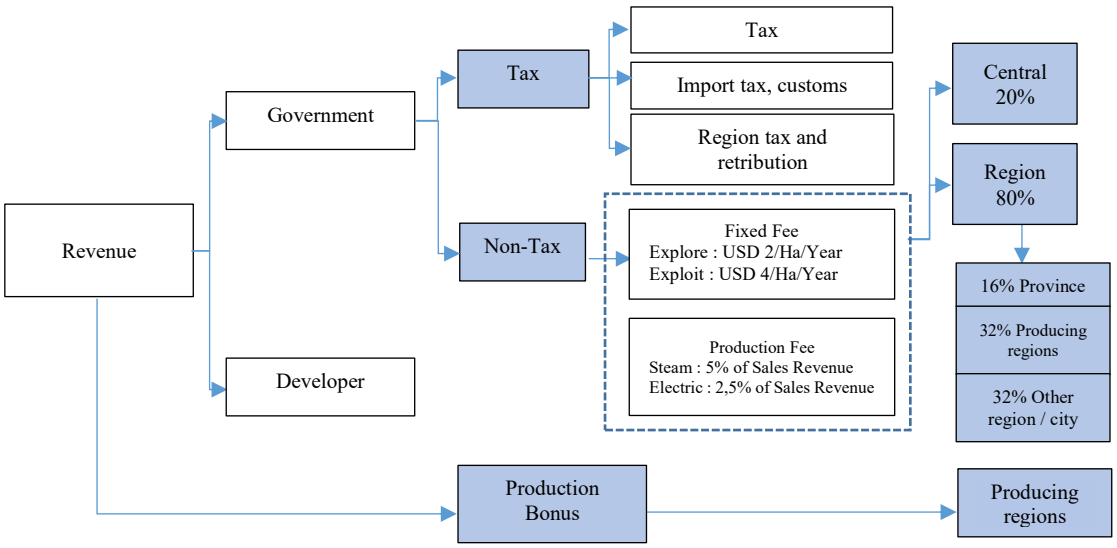
In accordance with article 2, the Government Regulation states that the imposition of production bonuses for all ongoing development projects is from the first unit to produce commercially.

Article 3 of the Government Regulation states that the amount of the production bonus for the developer is:

- 1% of gross revenue from steam sales
- 0.5% of gross revenues from electricity sales.

The calculation period for production bonuses within concession of IPB is carried out on an annual basis and is calculated from January 1 to December 31.

With regard to the concession, the flow of state income from geothermal exploitation can be described in accordance with Law Number 21 year 2014 as follows:



e.g. Doing Geothermal Business in Indonesia, EBTKE (June 2018)

Figure 2.1: Flow of State Income from Geothermal Business in accordance with Law Number 21 year 2014

2.4 Duration of Geothermal License (IPB)

Geothermal License (IPB) is granted by the Government for developers to carry out exploration, exploitation and utilization of geothermal energy. In accordance with article 29 of the Law on Geothermal No. 21 year 2014 that:

- IPB has a maximum period of 37 years and by the Minister of Energy and Mineral Resources (ESDM) can be extended for a maximum of 20 years for each extension. Submission is at the latest 5 years and no later than 3 years before IPB ends and the Minister is obliged to give approval or rejection of the renewal application no later than 1 year after the requirements for the application are completely submitted.
- Exploration activities has a period of 5 years since IPB was issued and can be extended twice with each one year including the preparation of feasibility studies.
- Exploitation and utilization activities have a maximum period of 30 years from the feasibility study approved by the Minister of Energy and Mineral Resources.

3. ELECTRICITY CONDITIONS IN ACEH PROVINCE

3.1 Electricity System in Aceh Province

The electricity system in Aceh consists of a 150 kV Sumut-Aceh interconnection system and an isolated system with a distribution voltage of 20 kV. Most of the Aceh power system is supplied by the Sumbagut 150 kV interconnection system and a small portion is still in isolated areas. At present the area supplied with the 150 kV interconnection system covers the east coast of Aceh Province and Meulaboh and its surroundings. Whereas the other west coast and the middle of Aceh and the islands are still supplied by Diesel Generator (PLTD) through a 20 kV network. In an isolated 20 kV system which includes Aceh Singkil, Subulussalam City,

Blangkerejen system (Gayo Lues), Takengon System (Central Aceh) there is a rental generator to supply the system. The isolated systems instead of Sumatra are the City of Sabang, the Sinabang system (Simeulue) and other small systems.

Figure 3.1: Electricity System of Aceh Region (RUPTL PLN 2019 – 2028)

3.2 Illustration of Electricity Demand in Aceh Province

Based on data from the PLN Electricity Supply Business Plan (RUPTL) in 2019-2028, the realization of electricity sales in Aceh Province increased from 1580 GWh in 2011 to 2603 GWh in 2018 or experienced an average growth of 7.4%. Electricity consumption in Aceh Province in 2018 is the household sector that has the largest proportion (62%) followed by the business sector (16%), the public sector (15%) and the smallest is the industrial sector (7%).

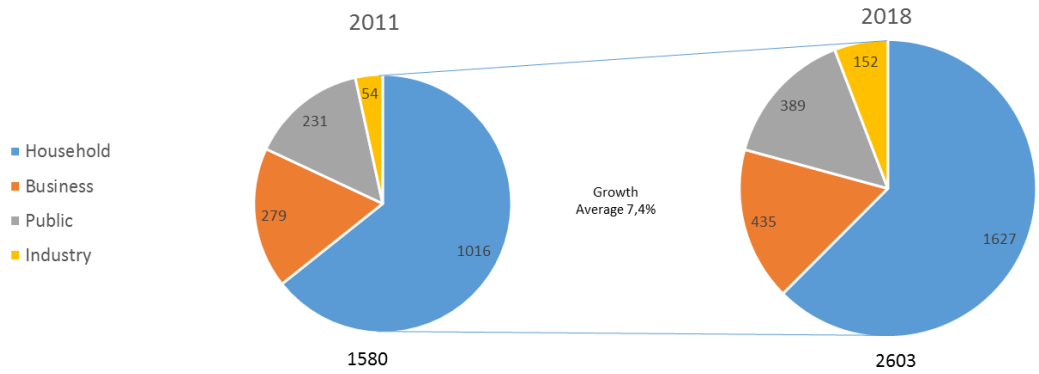


Figure 3.2: Realization of Electricity Sales Growth in Aceh Province year 2011 – 2018

While the projection of electricity sales in Aceh Province in 2019 amounted to 2811 GWh and increased to 5664 GWh in 2028 or is estimated to experience an average growth of 8.1% in that period.

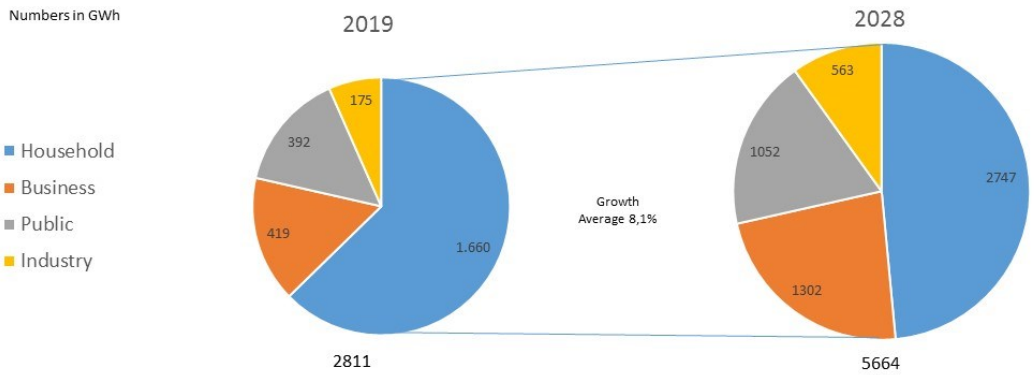


Figure 3.3: Projection of Electricity Sales Growth in Aceh Province year 2019 - 2028

The total existing power plant in Aceh Province in 2018 is 680 MW with a net power capacity of 559 MW. Electricity demand and peak load in 2018 amounted to 424 MW. Peak load average growth is projected around 6.94% from 2019 to 2028.

Table 3.1: Existing Power Plants in Aceh Province (2018)

No	Power System	Type of Generator	Owner	Fuel	Total Capacity (MW)	Nett Power Capacity (MW)
1	Sumbagut	PLTU	PLN	Coal	220	180
3	Sumbagut	PLTMG	PLN	Gas	184,9	179,9
4	Sumbagut	PLTMH	PLN	Hydro	2,4	2
5	Sumbagut	PLTD	PLN	Diesel	187,7	121,1
6	Sinabang	PLTD	PLN	Diesel	13,8	9,1
7	Sabang	PLTD	PLN	Diesel	12,9	8,7
Total PLN					**621,7**	**500,8**
8	Sumbagut	PLTMG	IPP	Gas	24	24
9	Sumbagut	PLTMH	IPP	Hydro	1,5	1,5
Total IPP					**25,5**	**25,5**
10	Sumbagut	PLTD	Rental	Diesel	33	33
Total Rental					**33**	**33**
TOTAL EXISTING GENERATOR					**680,2**	**559,3**

Table 3.2: Projection of Electricity Demand and Peak Load in Aceh Province

Year	Economic Growth (%)	Sales (GWh)	Production (GWh)	Peak load	Num of Customer
2019	5,73	2810	3164	551	1.462.543
2020	5,94	3056	3422	591	1.497.062
2021	6,15	3326	3707	636	1.529.967
2022	6,07	3663	4076	694	1.560.080
2023	5,99	4021	4459	753	1.589.086
2024	5,89	4357	4816	808	1.616.819
2025	5,79	4675	5149	857	1.643.635
2026	5,67	4992	5480	906	1.670.468
2027	5,55	5320	5822	955	1.696.987
2028	5,43	5664	6180	1007	1.723.445
Growth (%)	**5,70%**	**8,11%**	**7,73%**	**6,94%**	**1,92%**

As stated in the 2019-2028 PLN RUPTL, PLN plans to increase its generation capacity by 3521 MW by 2028 from various types of plants. For this type of Geothermal Power Plant (PLTP), there is an estimated 440 MW from various developers.

4. THE DEVELOPMENT OF SEULAWAH AGAM GEOTHERMAL AREA

4.1 Seulawah Agam WKP Management Scheme

PT Pertamina (Persero) after appointed as the winner of the Seulawah Agam Geothermal WKP auction in 2013, directly assigned its subsidiary in the geothermal sector, PT Pertamina Geothermal Energy (PGE), to manage and develop the WKP in 2014.

In accordance with the provisions required in the Request For Proposal (RFP) by Aceh Province Government, that the auction winner is obliged to establish a joint venture company with a Regional Owned Enterprise (BUMD) which has been designated in this case the Perusahaan Daerah Pembangunan Aceh (PDPA). Establishing joint venture between PGE and PDPA was stated in a Shareholder Agreement (SHA) signed on May 10, 2016. The joint venture company was named PT Geothermal Energi Seulawah (GES). The Seulawah Agam WKP development management scheme can be described as follows:

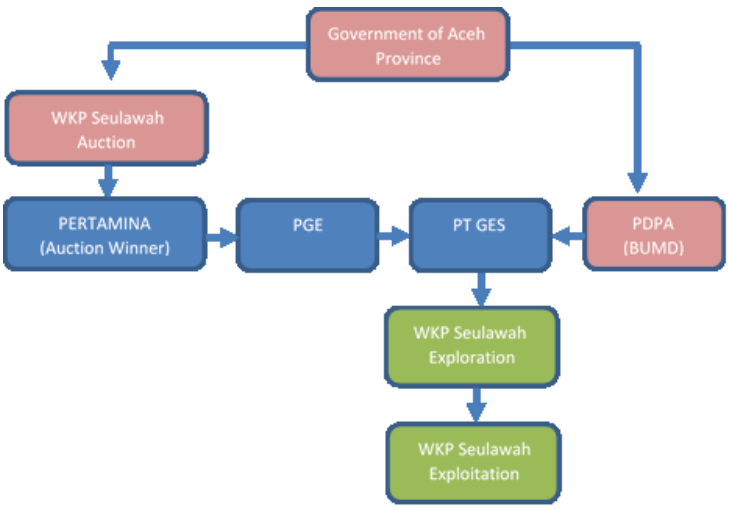


Figure 4.1: Seulawah Agam WKP Management Scheme

The Seulawah Agam WKP management scheme with a partnership pattern like this will have benefit for both parties, PGE and the Aceh Province Government. The Aceh Government is expected to be able to encourage acceleration of activities related to the licensing and land processes which are usually being a common obstacle to large projects in Indonesia, especially geothermal. In addition, the Regional Government is also expected to be able to encourage this project to be commercially viable by supporting market development such as direct sales to the existing industrial estate. Thus in addition as efforts to accelerate development, the risk of license issuance, land and commerciality problem can be shared with the Regional Government.

4.2 Exploration Plan for Seulawah Agam WKP

After the Seulawah Geothermal Permit Num. 1/1 / IPB / PMDN / 2018 issued by the Investment Coordinating Board of the Republic of Indonesia (BKPM), PGE immediately started a series of exploration activities targeted for 4 years completion. Exploration activities began with the implementation of geochemical surveys and the additional geophysical survey that held in 2018 then proceed with Light Detection and Ranging (LIDAR) aerial mapping and comprehensive geoscience studies based on survey results. The land acquisition plan starts from 2019 and continues for topographic activities and infrastructure development to support exploration drilling activities. 3 exploration wells are planned to be carried out after the infrastructure development is completed and production tests are continued to obtain a proven backup.

The tentative schedule for the planned exploration of Seulawah Agam WKP is as follows:

Table 4.1: Tentative Schedule for Exploration of Seulawah Agam WKP

Exploration Activities	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Izin Panas Bumi																
UKL / UPL (Environmental Permitt)																
Permitt																
Survey & Geoscience Study																
LIDAR Survey																
Land Acquisition & Infrastructures																
Exploration Wells Drilling																
Production Test																
Resources Confirmation																
Make-Up Well																

5. FACTORS AFFECTING THE COMMERCIALITY OF SEULAWAH DEVELOPMENT

The commercial value of the Seulawah geothermal development project is certainly influenced by several things besides the amount of the reserve itself such as the value of investment, the price of geothermal electricity, funding schemes and if there are any incentives from the Government.

5.1 Value of Investment

The investment value of geothermal projects has a range of USD 3 – 5.6 Million / MW (data from the 2015 - 2017 project) with the drilling cost component being the most dominant thing. The drilling cost component can reach 48% of the total project value up to the Commercial Operation Date (COD).

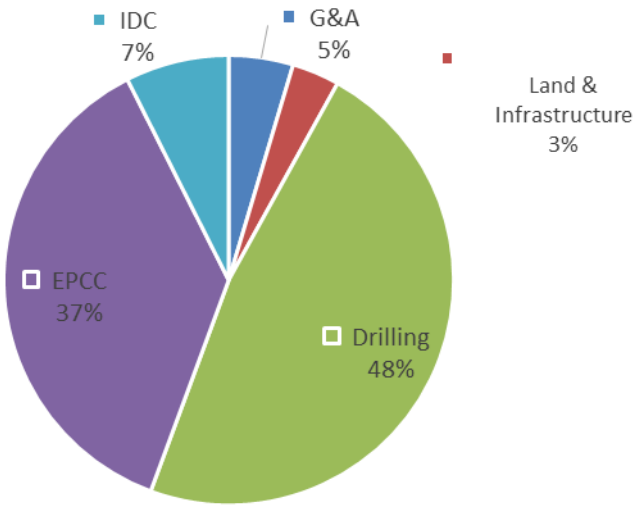
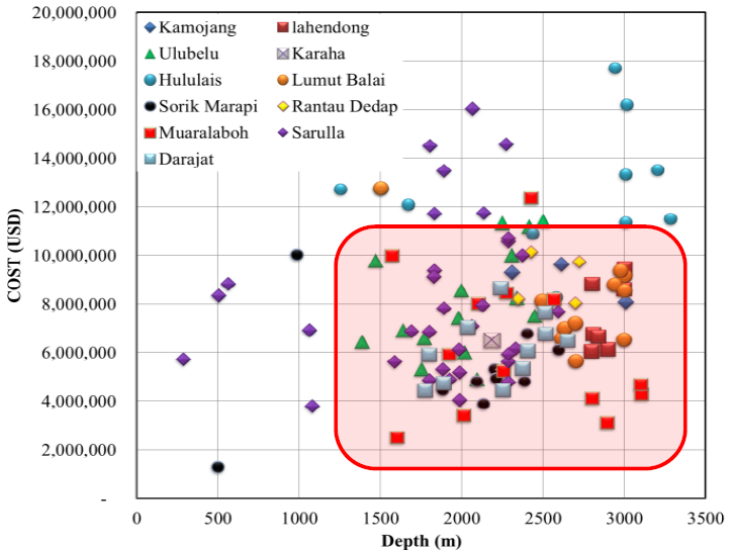


Figure 5.1: Illustration of Investment Costs Component of a Geothermal Project

Based on data from the Directorate General of EBTKE, geothermal drilling with a depth of 2500 mD - 3000 mD will cost around USD 4 - 10 million. Although in reality some data shows the realization of costs can reach above USD 12 million. The realization of this drilling cost depends on the subsurface conditions so that the drilling time can be longer if it encounters a very large subsurface challenge. The value of drilling will affect the amount of investment in the geothermal project as a whole, therefore an effective and efficient drilling operational strategy is needed.



e.g. Geothermal Directorate EBTKE (2018)

Figure 5.2: Variation of geothermal drilling costs in Indonesia

5.2 Price of Geothermal Electricity

Utilization of renewable energy sources for the supply of electricity in Indonesia is regulated in the Regulation of the Minister of Energy and Mineral Resources Number 12 year 2017. In article 11 it is stated that the electricity prices of Geothermal Power Plants that will be purchased by PT PLN refer to electricity Basic Cost (BPP) determined by the Government with the following provisions:

- If the price of regional BPP is higher than the price of the national BPP, then the price of electricity refers to the price of regional BPP.
- If the price of a regional BPP is equal to or lower than the national BPP price, then the electricity price will be determined by the parties (developers and PLN).

Referring to the Decree of the Minister of Energy and Mineral Resources Number 55K / 20 / MEM / 2019 concerning the amount of the electricity Basic Cost of PT PLN in 2018 the price of electricity that can be purchased by PT PLN in the Aceh region is USD 11.74 cent / KWh. While the national electricity BPP in 2018 is USD 7.86 cent / KWh.

5.3 Financing Schemes and Government Incentive

Financing factors will affect the commercial value of this project. If this project gets low interest financing such as soft loan from several financial institutions such as previous PGE projects, actually this will reduce the cost of capital of the project and boost its economic value. Some of the financing schemes will be exercised for this project such as geothermal funds from the government of the Republic of Indonesia and soft loan with lower interest rates and longer terms of loan repayment from financial institution. The Government of the Republic of Indonesia at this time has also compiled several policies related to incentives for the development of renewable energy in this country.

6. CONCLUSIONS

- Since the issuance of Law No. 21 of 2014 concerning Geothermal Energy, so that indirect utilization of Geothermal Energy in certain Working Areas in Indonesia must obtain Geothermal License (IPB). Indirect utilization is the business of exploiting Geothermal energy through the process of converting from heat energy and / or fluid into electrical energy.
- The real benefits obtained by the government from this geothermal activity are:
  1. Increased use of clean energy that is environmentally friendly for electricity generation and supports government programs to increase the proportion of renewable energy use in Indonesia Energy Mix.
  2. Encouraging economic growth in Aceh Region.
  3. There is additional income through Non-Tax income/PNBP (Fixed fees and production fees) and taxes.
- The development of the Seulawah Agam WKP with a joint venture scheme with the Aceh Regional Government will provide the following benefits:
  1. Sharing the risk of geothermal investment activities in Seulawah Agam.
  2. Ease to solve licensing and land problems that often occur in large projects in Indonesia, especially geothermal.
  3. There are opportunities to develop the market by selling electricity directly to developing industrial estates in Aceh Region.
  4. The Regional Government has the opportunity to get involved, get exposure, knowledge and skills in the geothermal field directly.
  5. PDPA is also entitled to dividends regarding the amount of participation in the GES joint venture.
- To support the commercial development of geothermal energy in Indonesia, the support of stakeholders is needed, including the government with its policies and incentives, communities, supporting industries and financial institutions that provide low interest financing with a longer repayment period terms.

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