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# A Review of Geothermal Pricing Policy and Its Impacts on Geothermal Development in Indonesia

Yuniarto and Eko Hari Purwanto

Directorate of Geothermal, Ministry of Energy and Mineral Resources, Jl. Pegangsaan Timur No. 1 Jakarta

yoen_tm113@yahoo.com

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**ABSTRACT**

Geothermal power development in Indonesia has been started in the early 1910s to 1970s where numbers of geoscientific explorations and shallow exploration drilling had taken place in Kamojang. Geothermal Power Plant Kamojang Unit 1 with the generation capacity of 30 MW is the first Geothermal Power Plant in Indonesia which has been operated commercially since 1982 and it has been successfully maintain operations for around 40 years. It has contributed to total of installed geothermal power plants in Indonesia which amounts to 1,948.5 MW in 2018. Geothermal enterprising in Indonesia can be divided into 2 periods, before and after the issuance of Geothermal Law Number 27 of 2003.

Geothermal enterprising prior to 2003 was conducted by giving geothermal concession authority to PERTAMINA. This constituted PERTAMINA to develop their concession by themselves, commonly known as Own Operation. With aims to hasten geothermal development, PERTAMINA was allowed to involve other parties. Private sector was involved in cooperation mechanism to form Joint Operation Contract with PERTAMINA.

Since the issuance of the Geothermal Law in 2003, Ministry of Energy and Mineral Resource (MEMR), Government of Indonesia, has been fully in charge of regulating geothermal enterprising which was previously entitled to PERTAMINA. Furthermore, in order to accelerate geothermal development, the Government issued various regulations and policies, one of which was the policy on geothermal pricing. Until now, the government has issued 7 policies on geothermal prices through MEMR Regulation. This paper will discuss each of these pricing policies in detailed and evaluates the impact of each of these policies on geothermal development in Indonesia.

## 1. INTRODUCTION

Indonesia is ranked 5$^{th}$ in the world as one of the most populated countries as of 2018. Based on published data by Indonesian Central Statistic Agency in 2018, Indonesia has been residence for 261.9 million citizens which occupy 1.9 million km$^2$. Indonesian Archipelago is composed by 16,065 islands and Indonesia is 15$^{th}$ as largest country in the word by area.

Indonesia is geographically located in southern extension of Eurasian plate (Darmin and Sidi, 2000). Plates which underlies Indonesian archipelago are flanked to the south and west by Indo-Australian plate and to the east by Philippine Sea Plate and Pacific Plate as described by Indonesia Geological Map (Figure 1). Southwardly Eurasian plate collides with Indo-Australian plate that slides northward creating convergent boundaries along Indonesian west and southern coastal line. This plate collision constructs subduction zone and is associated with volcanic belt that coexistent to geothermal origins.

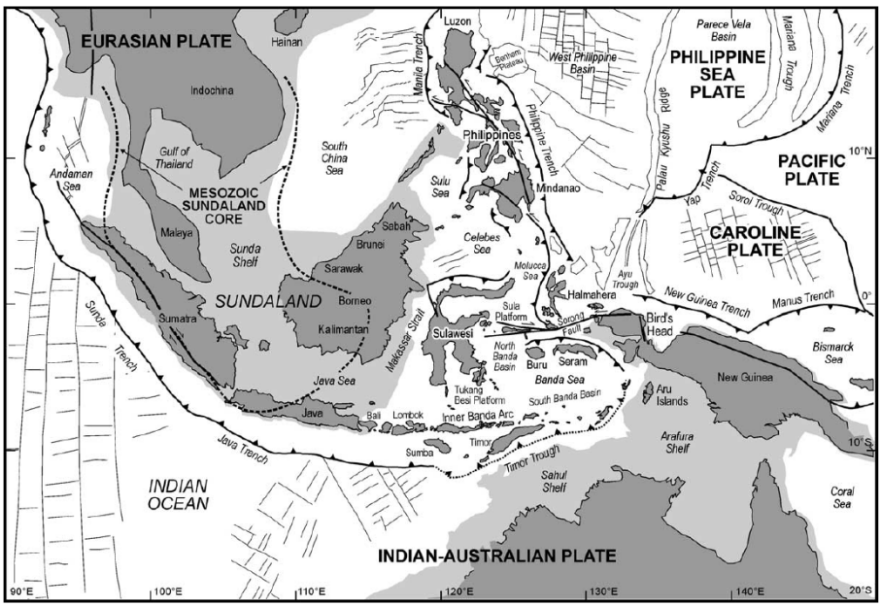


**Figure 1: Indonesia Geological Map (Hall, 2000)**

Indonesia has enormous geothermal potential. According to Geological Agency, MEMR (2018), 25,386 MW of resource has been discovered in 349 geothermal prospects which spread from western to eastern Indonesia. Distribution of geothermal prospect can be seen in Figure 2.

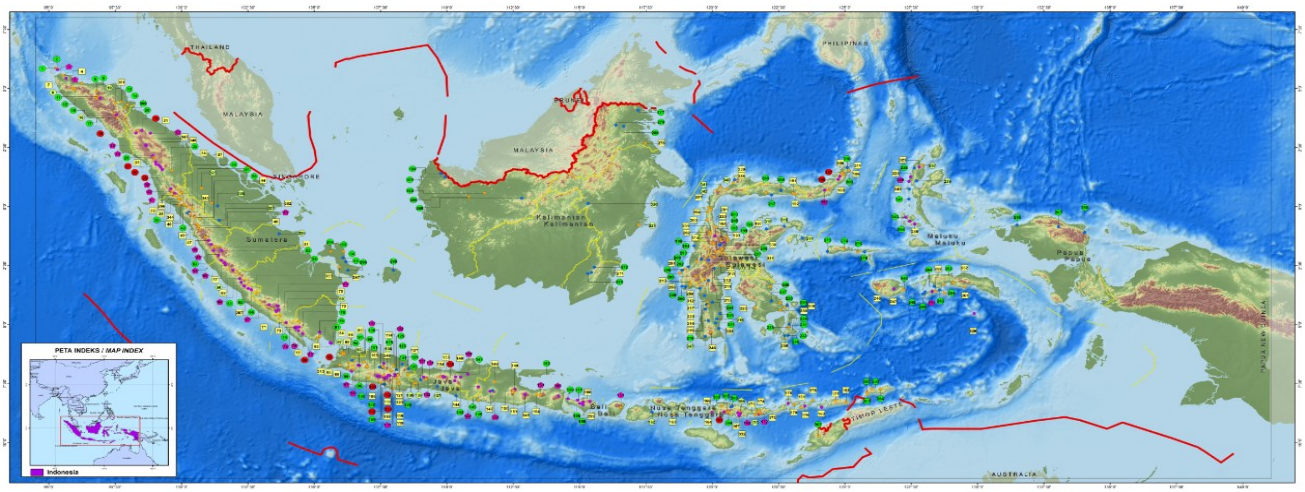


**Figure 2 : Indonesia Geothermal Distribution Map (Geological Agency, 2018)**

Utilization of geothermal energy in Indonesia can be divided by 2, namely direct use purpose and indirect use purpose for electricity generation. Geothermal resources in Indonesia are predominantly utilized for electricity generation. The total geothermal power plants that have been successfully installed and support electricity generation in Indonesia at the end of 2018 are at the magnitude of 1,948.5 MW (Table 1). This utilization is only accounts for 7% of total available resources of 25,386.5 MW.

**Table 1: Geothermal power plants installed capacity in Indonesia as of 2018**

| No | Geothermal Working Areas | Geothermal Power Plants | Developers | Turbine Units | Installed Capacity (MW) |
|---|---|---|---|---|---|
| **1** | Kamojang Darajat | Kamojang | PT. Pertamina Geothermal Energy | 1 x 30 MW<br>2 x 55 MW<br>1 x 60 MW<br>1 x 35 MW | 235 |
| | Kamojang Darajat (JOC) | Darajat | Star Energy Geothermal Darajat II, Ltd | 1 x 55 MW<br>1 x 94 MW<br>1 x 121 MW | 270 |
| **2** | Cibeureum Parabakti | Salak | Star Energy Geothermal Salak, Ltd. | 3 x 60 MW<br>3 x 65,6 MW | 377 |
| **3** | Dataran Tinggi Dieng | Dieng | PT. Geo Dipa Energi | 1 x 60 MW | 60 |
| **4** | Sibayak Sinabung | Sibayak | PT. Pertamina Geothermal Energy | 1 x 10 MW<br>(monoblok) 2 MW | 12 |
| **5** | Pangalengan (JOC) | Wayang Windu | Star Energy Geothermal Wayang Windu Ltd. | 1 x 110 MW<br>1 x 117 MW | 227 |
| | Pangalengan (Patuha Area), | Patuha | PT Geo Dipa Energi | 1 x 55 MW | 55 |
| **6** | Lahendong Tompaso | Lahendong | PT. Pertamina Geothermal Energy | 6 x 20 MW | 120 |
| **7** | Waypanas | Ulubelu | PT. Pertamina Geothermal Energy | 4 x 55 MW | 220 |
| **8** | Ulumbu | Ulumbu | PT. PLN (Persero) | 4 x 2,5 MW | 10 |
| **9** | Mataloko | Mataloko | PT. PLN (Persero) | 1 x 2,5 MW | 2,5 |
| **10** | Sibual Buali | Sarulla | Sarulla Operations Ltd. | 3 x 110 MW | 330 |
| **11** | Karaha-Cakrabuana | Karaha | PT. Pertamina Geothermal Energy | 1 x 30 MW | 30 |
| | | **TOTAL** | | **39 Unit** | **1.948,5** |

In addition to electricity generation, geothermal utilization is also applied for direct utilization. Based on data from Lund & Boyd (2015) direct utilization capacity of geothermal energy in Indonesia is at the magnitude of 2.30 MW and 42.6 TJ/annum. The direct utilization of geothermal energy in Indonesia is commonly used for the tourism sector, namely in the form of hot springs and the hospitality industry. For agricultural sector, direct utilization is in the form of drying agricultural products and sterilizing planting media and industrial sectors, namely for the production of palm sugar.

## 2. GEOTHERMAL DEVELOPMENT IN INDONESIA

Indonesia has started geothermal development from early 1900s, long before Independence Day achieved. First attempt on geothermal exploration survey was conducted by Vulcanological Survey of Indonesia (VSI) in 1919. The exploration then continued by drilling several shallow wells by Dutch Indies Government from 1926 to 1928 (DiPippo, 2012). The result of drilling which conducted during Dutch colonization is KMJ-3 well with the depth of 66 m and has been producing until recent time (Hochstein & Sudarman, 2008). The first achieved milestone of Indonesia Geothermal Development was the commissioning of Kamojang Unit 1 that accomplished Commercially Operation Date (COD) in 1982.

With reference to the issuance of Geothermal Law, geothermal enterprising mechanism is divided by 2 periods i.e.:

1. Before the issuance of Geothermal Law Number 27 of 2003.
2. After the issuance of Geothermal Law Number 27 of 2003 (this law has been revoked and has been replaced by Geothermal Law Number 21 of 2014).

Geothermal enterprising prior to 2003 was conducted by Presidential Decree Number 22 of 1981 as legal basis. This Presidential Decree entitled PERTAMINA to handle geothermal enterprising by conducting exploration and exploitation of geothermal resources in Indonesia. PERTAMINA have the ability to develop their concession both by Own Operation and by involving other private sector in cooperation mechanism to form Joint Operation Contract. These schemes are mostly known as existing enterprising.

Geothermal Law was first established in 2003. This regulation implements shifting in geothermal enterprising schemes from PERTAMINA concession authority ("Kuasa Pengusahaan") and Joint Operation Contract (JOC) into concession permit (Geothermal Business Permit/ GBP) or famously known nowadays as "Izin Panas Bumi" (IPB). In Geothermal Law Number 27 of 2003, geothermal enterprising was still considered as mining activity, due to its correspondence to Mining Law, therefore geothermal development in conservation area is prohibited. Geothermal Working Area (GWA) is established by Central Government/ MEMR. Furthermore, Regional Government has the authority to announce and to conduct open GWA tendering in order to attract interest. Then Regional Administrator will issue GBP to the winner of GWA tendering process.

Geothermal Law Number 27 of 2003 has been revoked by Geothermal Law Number 21 of 2014. This enables geothermal development in conservation area. With this new established law, GWA tendering process and the issuance of GBP has become the full authority of Central Government. In this case, GWA tendering is conducted by MEMR, while the GBP issuance is conducted by Indonesia's Investment Coordinating Board. Differences of geothermal enterprising before and after 2003 can be seen in figure 3.

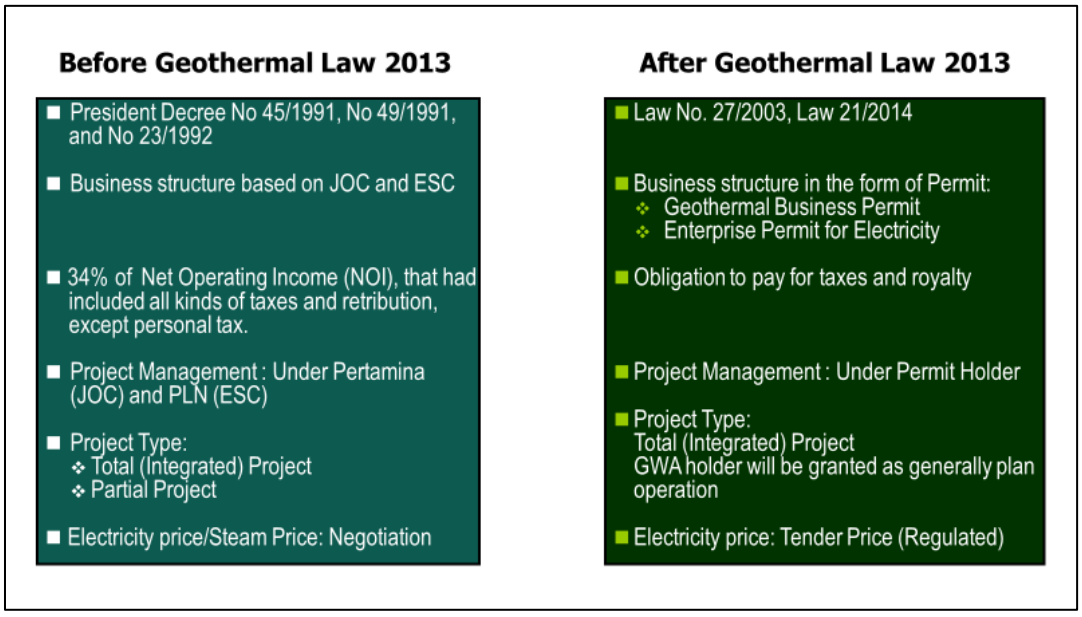


**Figure 3 : Comparison of Geothermal Enterprising Schemes in Indonesia**

## 3. GEOTHERMAL PRICING REGULATION

In previous Geothermal Law Number 27 of 2003 and in prevailing Geothermal Law Number 21 of 2014, Government has the obligation to regulate pricing of geothermal energy. In derivative regulation of Geothermal Law 27 of 2003, which was Government Regulation Number 59 of 2007 stated that MEMR had the ability to specify steam price for geothermal power plant. Furthermore, as a derivative regulation of Geothermal Law Number 21 of 2014, Government Regulation Number 7 of 2017 is issued to replace Government Regulation Number 59 of 2007. Government Regulation Number 7 of 2017 articulates that MEMR has the responsibility

to determine geothermal electricity pricing by taking economic price as consideration. By having this as fundamental legal basis, MEMR has designated the price of geothermal electricity.

### 3.1 MEMR Regulation Number 14 of 2008

Government of Indonesia issued MEMR Regulation Number 14 of 2008 regarding Ceiling Price of Electricity Sales from Geothermal Power Plant, to facilitate accelerate geothermal development. This regulation is established in 9 May 2008. This regulation governed ceiling price in geothermal tendering process with regards to PT Perusahaan Listrik Negara (PLN) Electricity Cost Production of Generation (CPG) or as known by "Biaya Pokok Pembangkitan (BPP)". This regulation determine ceiling price with the following details:

1. 85% of BPP of local electricity High Voltage (HV) or Medium Voltage (MV) system for capacity of 10-55 MW.
2. 85% of BPP of local electricity HV system for capacity of larger than 55 MW.

Furthermore, with aims to implement MEMR Regulation Number 14 of 2008, Directorate General of Electricity on behalf of MEMR determined BPP-HV, MV, and Low Voltage (LV). This BPP was issued by MEMR Decree Number 269-12/26/600.3/2008 about PLN BPP as seen in Table 2.

**Table 2 : PLN BPP as of 2008**

| No. | Electricity system | Sub System | BPP-HV (Rp/kWh) | BPP-MV (Rp/kWh) | BPP-LV (Rp/kWh) |
|---|---|---|---|---|---|
| 1 | System North Sumatera | Nangroe Aceh Darussalam | 1,891 | 2,158 | 2,603 |
| | | North Sumatera | | 1,984 | 2,306 |
| 2 | System South Sumatera-West Sumatera-Riau | West Sumatera | 565 | 790 | 1,044 |
| | | Riau | | 1,164 | 1,433 |
| | | South Sumatera, Jambi, and Bengkulu | | 696 | 869 |
| | | Lampung | | 667 | 860 |
| 3 | System Bangka Belitung | Bangka Belitung | - | 2,476 | 2,919 |
| 4 | System West Kalimantan | West Kalimantan | 2,312 | 2,546 | 3,143 |
| 5 | System South Kalimantan and Central Kalimantan | South Kalimantan and Central Kalimantan | 1,148 | 1,611 | 1,998 |
| 6 | System East Kalimantan | East Kalimantan | 1,732 | 1,965 | 2,260 |
| 7 | System Sulawesi Utara, Sulawesi Tengah and Gorontalo | Sulawesi Utara, Sulawesi Tengah and Gorontalo | 974 | 1,676 | 2,063 |
| 8 | System South Sulawesi, West Sulawesi and South East Sulawesi | South Sulawesi, West Sulawesi and South East Sulawesi | 1,103 | 1,249 | 1,505 |
| 9 | System Maluku and North Maluku | Maluku and North Maluku | - | 2,320 | 2,919 |
| 10 | System Papua | Papua | - | 2,526 | 3,192 |
| 11 | System West Nusa Tenggara | West Nusa Tenggara | - | 2,289 | 2,743 |
| 12 | System East Nusa Tenggara | East Nusa Tenggara | - | 2,433 | 3,072 |
| 13 | System Jawa-Madura-Bali | Bali | 783 | 859 | 1,012 |
| | | East Jawa | | 855 | 1,030 |
| | | Central Jawa and DI Yogyakarta | | 849 | 1,011 |
| | | West Jawa & Banten | | 853 | 1,024 |
| | | DKI Jakarta, Tangerang | | 850 | 1,005 |

Since the issuance of MEMR Regulation Number 14 of 2008, Regional Government has successfully tendered 6 GWA and issued GBP to geothermal companies to develop 6 GWA namely Tampomas, Cisolok Cisukarame, and Tangkuban Perahu in West Jawa, Jaboi in Aceh, Sokoria in East Nusa Tenggara and Jailolo in North Maluku. Unfortunately, there are only 2 GWA out of 6 GWA, in which exploration activities have been completed and currently entering preparation for development, namely Jaboi and Sokoria. As for other 4 GWA, GBPs of Tampomas and Cisolok Cisukarame have been revoked by the MEMR due to expiration time to complete exploration while GBPs for Jailolo and Tangkuban Perahu has been returned to MEMR to due to failings in reaching pricing negotiation with the electricity off taker (PLN) and expiration time to complete exploration, respectively. Structured explanation regarding geothermal pricing situation in 6 GWAs which tendered under MEMR Regulation Number 14 of 2008 can be seen in Table 3.

**Table 3: GWA Tender under MEMR Regulation Number 14 of 2008**

| No. | GWA | Location | BPP (Rp/kWh) | Tender price (Rp/kWh) | Tender capacity (MW) | Current status |
|---|---|---|---|---|---|---|
| **1** | Tampomas | West Jawa | 783 | **598.0** | 45 | Revoked |
| **2** | Cisolok Cisukarame | West Jawa | 783 | **630.0** | 50 | Revoked |
| **3** | Tangkuban Perahu | West Jawa | 783 | **533.6** | 110 | Returned |
| **4** | Jaboi | Sabang Island, Aceh | 1,891 | **1,705.0** | 10 | Development |
| **5** | Sokoria | Flores, East Nusa Tenggara | 2,433 | **1.250,69** | 15 | Development, expected COD in 2020 |
| **6** | Jailolo | North Maluku | 2,320 | **1,727.54** | 5 | Returned |

### 3.2 MEMR Regulation Number 05 of 2009

MEMR Regulation Number 05 of 2009 fundamentally regulates the guidelines for purchasing electricity from renewable energy sources which includes geothermal energy. PLN purchased electricity based on the Electricity Supply Business Plan, as known as "Rencana Umum Penyediaan Tenaga Listrik"/ RUPTL which was approved by the MEMR. PLN is also obliged to purchase electricity that utilizes renewable energy sources with a capacity of up to 10 MW. In this regulation PLN is required to make its own Estimated Price (Harga Perkiraan Sendiri/HPS) based on the location of the plant, the amount of capacity, the capacity factor with taking into account several assumptions as follow:

1. Local/ Domestic Content (Tingkat Komponen Dalam Negeri/TKDN),
2. Price and quality of fuel,
3. Exchange rates, and
4. Macro economic indicators.

Particularly for geothermal generation, there are additional parameters that are used by PLN in calculating the estimated price, namely cost of exploration and field development. However, there is no GWA that has been successfully tendered by the government using this Ministerial Regulation.

### 3.3 MEMR Regulation Number 32 of 2009

This MEMR Regulation governed highest ceiling price in geothermal GWA tender of maximum USD 9.7 cent/kWh. This policy is arranged as an improvement of pervious pricing policy which is considered less attractive from project economic viability point of view. This regulation was applied for new GWA tender. This pricing scheme also can be applied for existing GWAs, with negotiations between Independent Power Producer (IPP) and PLN were possible to be carried out using the framework of this ceiling price.

**Table 4 : List of GWA which tendered using MEMR Regulation Number 32 of 2009**

| No. | GWA | Year of Tender | Location | Tender price (USD cent/kWh) | Tender capacity (MW) | Current status |
|---|---|---|---|---|---|---|
| 1 | Ungaran | 2009 | Jawa Tengah | 8.09 | 55 | Returned |
| 2 | Atadei | 2009 | East Nusa Tenggara | 9.0 | 5 | Returned |
| 3 | Muaralaboh | 2009 | Sumatera Barat | 9.4 | 220 | EPCC |
| 4 | Rajabasa | 2009 | Lampung | 9.5 | 220 | Exploration |
| 5 | Suoh Sekincau | 2010 | Lampung | 6.9 | 220 | Returned |
| 6 | Telaga Ngebel | 2010 | Jawa Timur | 7.55 | 165 | Exploration |
| 7 | Sorik merapi | 2010 | Sumatera Utara | 8.10 | 240 | EPCC |
| 8 | Kaldera Danau Banten | 2010 | Banten | 8.39 | 110 | Exploration |
| 9 | Blawan Ijen | 2010 | Jawa Timur | 8.58 | 110 | Exploration |
| 10 | Rantau Dedap | 2010 | Sumatera Selatan | 8.86 | 220 | EPCC |
| 11 | Guci | 2010 | Jawa Tengah | 9,09 | 55 | Revoked |
| 12 | Baturraden | 2010 | Jawa Tengah | 9.63 | 220 | Exploration |
| 13 | Huu Daha | 2010 | East Nusa Tenggara | 9.65 | 20 | Returned |

By using MEMR Regulation Number 32 of 2009, the government had successfully conducted 13 GWAs tenders which then lead to issuance of 13 GBPs to geothermal companies. Some of the GWAs that are currently entering development and Engineering, Procurement, Construction and Commissioning (EPCC), while other GWAs did not completed the exploration phase due to expiration

date of exploration phase that further leads to revocation of GBPs. Detailed GWAs that have been tendered using this regulation and their latest progress are described in Table 4.

### 3.4 MEMR Regulation Number 02 of 2011

MEMR Regulation Number 02 of 2011 revoked previous MEMR Regulation Number 32 of 2009. In principle, both MEMR regulations apply similar ceiling price, which is equal to USD 9.7 cents / kWh. The refinement was taken with aims to included article that PLN was required to formulate standard electricity Power Purchase Agreement (PPA) which can be implemented by IPPs.

By using MEMR Regulation Number 02 of 2011, Government has conducted 1 GWA tender, namely Gunung Ciremai in West Java province. Initial plan of Gunung Ciremai development which stated during tender process was 150 MW. Business entity that won this tender proposed the lowest price of USD 9.6 cent/ kWh. However unfortunately the business entity that won the tender process did not wish to continue to exploration phase and has returned Gunung Ciremai GWA to MEMR in 20015. This GWA is currently an open GWA

### 3.5 MEMR Regulation Number 22 of 2012

MEMR Regulation Number 22 of 2012 has applied Feed-in Tariff policy substantially. This regulation also governs that tariff stated in the regulation become a ceiling tariff which guided PLN in purchasing electricity from IPPs. Pricing policy is divided into several systems taking into account HV and MV. The list of areas and applied prices in the MEMR Regulation Number 22 of 2012 can be seen in table 5.

**Table 5 : Ceiling Tariff List of MEMR Regulation Number 22 of 2012**

| No. | Area | Geothermal electricity price (USD cent/kWh) | |
|---|---|---|---|
| | | High Voltage | Medium Voltage |
| 1 | Sumatera | 10 | 11,5 |
| 2 | Jawa, Madura & Bali | 11 | 12,5 |
| 3 | South Sulawesi, West Sulawesi and South East Sulawesi | 12 | 13,5 |
| 4 | North Sulawesi, Central Sulawesi and Gorontalo | 13 | 14,5 |
| 5 | West Nusa Tenggara & East Nusa Tenggara | 15 | 16,5 |
| 6 | Sistem Maluku & Papua | 17 | 18.5 |

The pricing mechanism in this regulation is divided into 6 areas, based on their connection to transmission voltages and not depends on capacity development. This scheme was hoping to provide economical price for developer thus can facilitate acceleration of geothermal development. The pricing were applied for all geothermal business schemes as follows:

1. Existing GWA for contract extension, unit expansion and new signed PPA with both parties mutually agreed to renegotiate.
2. New GWA for GBP holder after the issuance of this Regulation and GBP holder will negotiate PPA with both parties mutually agreed to renegotiate.

MEMR was not be able to conduct GWA tender by using the scheme which explained in this Ministerial Regulation. This is mainly due to other regulations that prevent pricing policies with feed-in tariff system.

### 3.6 MEMR Regulation Number 17 of 2014

This regulation uses approach of benefit which will be obtained from geothermal projects. The prices listed in MEMR Regulation Number 17 of 2014 are ceiling prices which dedicated for GWA tender that carried out by the MEMR. This regulation uses concept of areas and year of COD (Table 6). The areas are divided as follows:

1. Area I includes Jawa, Sumatera and Bali;
2. Area II include Sulawesi, Nusa Tenggara, Halmahera, Maluku, Papua and Kalimantan;
3. Area III includes isolated area within area I and II in which the electricity generation depends on fossil-based fuel.

**Table 6: Ceiling price of Purchasing Electricity from Geothermal Power Plant by PLN**

| Year of COD | Ceiling Price (USD cent/kWh) | | |
|---|---|---|---|
| | Area I | Area II | Area III |
| 2015 | 11.8 | 17.0 | 25.4 |
| 2016 | 12.2 | 17.6 | 25.8 |
| 2017 | 12.6 | 18.2 | 26.2 |
| 2018 | 13.0 | 18.8 | 26.6 |
| 2019 | 13.4 | 19.4 | 27.0 |
| 2020 | 13.8 | 20.0 | 27.4 |
| 2021 | 14.2 | 20.6 | 27.8 |
| 2022 | 14.6 | 21.3 | 28.3 |
| 2023 | 15.0 | 21.9 | 28.7 |
| 2024 | 15.5 | 22.6 | 29.2 |
| 2025 | 15.9 | 2.3 | 29.6 |

MEMR successfully attracted investor interest with this MEMR Regulation by conducting tender process in 3 GWA in 2016. The GBPs are issued in early 2017. The list of location and tender results can be seen in Table 7.

**Table 7 : GWA Tender using MEMR Regulation Number 17 of 2014**

| No. | GWA | Location | Tender price (Cent US$/kWh) | Proposed Capacity (MW) | Proposed Year of COD |
|---|---|---|---|---|---|
| 1 | Gunung Lawu | Area I (Central Jawa) | 10 | 110 | 2022 |
| 2 | Gunung Talang | Area I (West Sumatera) | 12.75 | 20 | 2022 |
| 3 | Way ratai | Area I (Lampung) | 13 | 55 | 2022 |

### 3.7 2 Regulation Number 50 of 2017

This regulation is initiated to replace MEMR Regulation Number 12 of 2017. This regulation governs the price for electricity which generated from industrial renewable energy sources namely: photovoltaic, wind, hydro, biomass, biogas, waste, geothermal and ocean. The purchasing price from this renewable energy power plant refers to the Regional BPP of PLN which also seeing geothermal development also associates with BPP. For the price of electricity from geothermal energy, the following mechanisms apply, i.e.:

1. In the case of BPP Generation in the local electricity system is higher than the National average of BPP Generation, hence the highest purchase price of electricity from geothermal power plant is the amount of BPP Generation in the local electricity system.
2. In the case of BPP Generation in the electricity system in the Sumatra, Jawa and Bali regions or other local electricity systems are equal to or less than National average of BPP Generation, hence the purchase price of electricity from the geothermal power plant is determined based on the agreement between parties;

In MEMR Regulation Number 50 of 2017, it is regulated that the purchase of electricity from geothermal power plant as referred in article 11, utilize cooperative pattern of Build, Own, Operate and Transfer (BOOT). The transmission network can be built by GBP holder based on a mutually beneficial mechanism (business to business scheme). MEMR Regulation Number 50 of 2017 is published in June 2017. Since the issuance of this regulation, MEMR yet to attract investment possibly due to economic rationale, which tender process has not been a success ever since. According to Wahjosoedibjo and Hasan (2018), MEMR Regulation Number 50 of 2017 is one of the hindrances that delay geothermal energy development in Indonesia. With this latest issuance of MEMR Regulation Number 50 of 2017, we deduce that the geothermal pricing policy returns to the beginning of evolution phase of geothermal pricing policy in 2008, in which we use PLN BPP as reference.

## 4. CONCLUSION

Since the issuance of Geothermal Law in 2003, the Indonesian government has encouraged development of geothermal energy through several policies, one of which is the pricing policy. Pricing policy which taken by the government certainly aims to encourage development of geothermal energy in Indonesia. The policies which has been published by the Indonesian government from 2008 to 2017 are as many as 7 regulations, which means that almost 1 pricing regulation are issued for every 1.5 years.

The pricing policies taken are based on several different approaches. Thus, the impacts on geothermal development in Indonesia throughout the GWA tender are also completely different. In general, the summary of pricing policies in Indonesia can be seen in Table 8.

**Table 8 : Summary of pricing policies in Indonesia**

| No. | MEMR Regulation | Pricing Calculation Basis | Tendered GWAs |
|---|---|---|---|
| 1 | MEMR Regulation Number 14 of 2008 | BPP (Cost Generation of Production) | 6 |
| 2 | MEMR Regulation Number 05 of 2009 | HPS (Estimated Price) | 0 |
| 3 | MEMR Regulation Number 32 of 2009 | Project Economic Viability | 13 |
| 4 | MEMR Regulation Number 02 of 2011 | Project Economic Viability | 1 |
| 5 | MEMR Regulation Number 22 of 2012 | Feed in Tariff | 0 |
| 6 | MEMR Regulation Number 17 of 2014 | Project Benefit | 3 |
| 7 | MEMR Regulation Number 50 of 2017 | BPP (Cost Generation of Production) | 0 |

This explains that different policy influences different impact on geothermal development in Indonesia that measured by GWA tender process. It can be seen that from the 7 existing policies, there are 4 MEMR Regulations which have succeeded in attracting investment interest in the GWA tender process, namely MEMR Regulation Number 14 of 2008, MEMR Regulation Number 32 of 2009, MEMR Regulation Number 02 of 2011 and MEMR Regulation Number 17 of 2014. Feed-in Tariff Policy that has been set through MEMR Regulation Number 22 of 2012 cannot be implemented considering it contradicts the regulations above. The Government Regulation states that in tender process, tender winner is determined through the least price bidding proposal.

Price policy with geothermal project viability and benefit approaches can be considered to be more successful when compared to policies based on BPP. It can be identified that most GWAs, which tendered using BPP as governing reference, cannot proceed to the stage of development and exploitation. The use of BPP in the tender process will be successful in regions where the BPP is relatively high, whereas in regions where the BPP is not attractive for investment, it will only hamper geothermal development because it is relatively more expensive compared to cheaper coal-fired or hydro power plants which are inevitably cheaper.

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