

The Development Of Geothermal Working Areas To Support Fulfillment Of Renewable Energy To Maintaining National Energy Security

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Abstract

Geothermal is a potential source of renewable energy in Indonesia. Therefore, the development of geothermal working area offerings can be a solution in meeting national energy needs by using renewable energy sources. The purpose of this article is to examine the Development of Geothermal Working Area Offering Policies to Support Fulfillment of Renewable Energy in the Context of Maintaining National Energy Security. In this study using evaluative research design with descriptive qualitative methods. In this study to determine the source of information on the research subjects using a purposive technique . Data collection techniques in this study are interviews, observation, and documentation. The data analysis technique used in this study uses a descriptive evaluative technique using Nvivo. The findings show that the development of geothermal working area offers is very important in supporting the fulfillment of renewable energy and maintaining national energy security. Geothermal is a renewable energy source that is unlimited and reliable because it is continuously produced by the earth naturally. The development of geothermal working area offerings can be carried out through efforts to explore and exploit geothermal potential in Indonesia. In this case, the government can act as a regulator and facilitator to accelerate the development of geothermal working area offers.

Keywords : Energy, Resilience, Supply, and Geothermal

Introduction

Energy security depends on several aspects, namely: the availability of energy supplies, the convenience of the community in meeting their needs for energy at affordable and reasonable prices, and is sustainable while still paying attention to environmental preservation. This is stated in the Government Regulation of the Republic of Indonesia number 79 of 2014 concerning the National Energy Policy (KEN). National energy security is also influenced by the strategic environment both from within (internal) and outside the country (external) (PP RI No. 79, 2014). Internal factors include economic growth, consumption of energy, and the availability of adequate energy infrastructure. While external factors include maintaining the stability of energy prices within the country as a response to the dynamics that occur in international energy prices. Therefore, reliability is needed in building national energy security to ensure the sustainability of the development of the energy sector, because this sector is a vital sector that influences national development.

In terms of energy security regulated by the National Energy Policy (KEN), currently energy in Indonesia has decreased in primary energy production (Dewan Energi Nasional, 2019). Primary energy production is produced from coal, natural gas, and a combination of crude oil and condensate production. The direction of domestic energy management as 3488 stated in the KEN consists of ensuring the availability of domestic energy supply by increasing the utilization of locally available energy sources, and gradually reducing dependence on imported fossil energy. Energy development prioritizes the use of available energy sources in the country, both fossil and non-fossil energy.

Geothermal is one of the sustainable resources among various types of fuel sources, in this way geothermal is relied upon to contribute to protecting the electricity supply for the local area with negligible natural effects. Indonesia is the largest archipelagic country in the world with an area of 7,810,000 km² (Pratama Oki, 2020)and a population of 270.20 million people (BPS, 2019). Currently, Indonesia is a country with the largest monetary development

Southeast Asia where this financial in development triggers a consistent expansion of meeting energy needs. According to information obtained from the Secretariat General of the National Energy Council, electricity demand per capita in 2025 will reach 2,030 kWh/capita (Business as Usual/BaU), 1,892 kWh/capita (Sustainable Development/ PB) and 1,834 kWh/capita (Low Carbon /RK). Meanwhile, per capita power demand in 2050 will reach 6,723 kWh/capita (BaU), 5,824 kWh/capita (PB) and 4,935 kWh/capita (RK). This condition is still below the power per capita target set out in the KEN, namely 2,500 kWh/capita in 2025 and 7,500 kWh/capita in 2050 (Tim Sekjen DEN, 2019). The progress of power utilization per capita can be seen in the figure below.



Figure 1. Development of Per Capita Electricity Consumption Source: (Team of Secretary General of the National Energy Council, 2019)

The above data is a concern in the context of energy security considering that oil production continues to decline. To serve the public's need for electrical energy, the government utilizes a Steam Power Plant (PLTU) of 35,220 MW, PLT Gas/PLT Gas and Steam Engine/PLT Gas (20,537 MW), PLT Air/ Minirohydro/ Microhydro (6,096 MW), PLT Diesel (4,781 MW) and Geothermal PLT (2,131 MW), and other EBT PLT (2,200 MW)(Kementerian ESDM, 2020).

The Central Government has made efforts to utilize geothermal energy as a power plant by preparing a National Energy General Plan (RUEN) in accordance with the National Energy Policy (KEN) through Presidential Regulation of the Republic of Indonesia No. 22 of 2017. In RUEN, PLTP development is focused on achieving a limit of 7,200 MW or 16% of the target in 2025 in order to support achieving a renewable energy mix of at least 45,100 MW from renewable power plants, which is 23% of the primary energy mix, in 2017 the achievements only 7.7%. From 2012 to 2020 the installed capacity of PLTP is 1,336 MW, increasing to 2,130 MW, in other words, it has increased by 794 MW. the target of 7,200 MW in 2025 set in the RUEN. This must be of particular concern to accelerate the development of Geothermal Energy in order to achieve the targets that have been set. PT Listrik Perusahaan Negara (Persero) (abbreviated as PLN), which has the authority to meet electricity needs in Indonesia, has prepared a General Plan for the Provision of Electricity (RUPTL) with reference to the achievement targets set in the RUEN, namely that in 2025 it is targeted that electrical energy originating from geothermal power will account for 23% of the primary energy mix. The PLTP speed increase program is included in the 35 GW program, Fast Track Program (FTP) I, and FTP II. However, this increase in speed cannot be achieved if in practice there are many obstacles that must be faced, especially in terms of the price of electricity generated by geothermal and other New Renewable Energy (EBT).

From 2008 to 2019 there were 43 Geothermal Working Areas spread across several provinces in Indonesia and some have produced electricity, there were 26 Geothermal Working Areas obtained through auctions from 2008 to 2016. In 2019 the Government carried out the process offers Geothermal Working Areas (WKP) by auctioning Geothermal Working Areas (WKP) in 3 areas, namely the Lainea WKP in Konawe Selatan Regency, Southeast Sulawesi with a regulated limit of 2 x 10 MW, then the Galunggung WKP, Tasikmalaya Regency, with a set limit set at 55 MW, and WKP Gunung Wilis in Nganjuk Regency, East Java, with a predetermined limit of 2 x 10 MW. However, these efforts have not produced the results as expected. Not a single PPL company is interested in registering for the WKP auction program even though the auction period has been extended. Since 2017 until now in 2022 there has been no issuance of new IPB originating from geothermal auctions, this can affect geothermal development and achievement of the RUEN target.

Based on the initial research background mentioned above, and in accordance with the government program listed in the RI Presidential Regulation number 22 of 2017 concerning the National Energy General Plan (RUEN) where there is an elaboration of the National Energy Management Policy and Strategy described in the RUEN Program Matrix, namely through a program to increase exploration of natural resources power and geothermal reserves by auctioning Geothermal CAs of at least 7 CAs per year , to achieve the target of PLTP development, the Perpres requires a Geothermal CA auction acceleration program . However, with the current conditions since the issuance of PP RI Number 7 of 2017 concerning Geothermal for Indirect Utilization, and its derivative Minister of Energy and Mineral Resources Regulation as the implementation of PP RI Number 7 of 2017 until now there has been no winner of the auction and issuance of a new IPB so there will be no there is the development of a new Geothermal Power Plant (PLTP) from a new WKP. so researchers are interested in the Geothermal Work evaluating Area Offering program as part of the National Energy General Plan Program (RUEN), and analysis related to the process problems related to policy government, it is hoped that researchers will understand more and gain an in-depth understanding of the importance of government policies in optimizing а geothermal renewable energy development program starting from the geothermal Working Area bidding program as a substitute for using fossil energy sources in maintaining energy security and independence. Several studies have been carried out related to energy security, including those related to the revitalization of old oil wells in Indonesia (Yurista, 2015). Furthermore, it was also disclosed the potential of renewable energy to be an energy policy goal for Indonesia (Caraka, 2017). Further, Research(Mary et al., 2017) reveal geothermal potential in national energy fulfillment. However, the problem that was revealed was that it needed policies from the government and investors to develop this renewable energy (Magnuson, 2012). This research will evaluate and develop concepts with an evaluation method developed by Stufflebeam which is comprehensively used to develop program, project, personal, product, institutional and system evaluations (Stufflebeam, 2007). The research subjects are spread from private companies, public companies, as well as government. Thus it can be indicated that there is no research related to the offering of Geothermal Working Areas. So that the renewal of this study is different in terms of the research object, namely the evaluation of geothermal working area offers and also research subjects on Power Plant (PPL) / Independent Power Developers Producers (IPP) other and relevant stakeholders . Apart from that, like previous research, in addition to recommendations for activities that are evaluated to stop, continue, or repair, this research is expected to also create a concept related to offering Geothermal Working Areas to support Renewable Energy Fulfillment in the Context of Maintaining National Energy Security With this empirical and theoretical gap, the researcher is interested in evaluating the Geothermal Working Area Offering program and analyzing this problem in relation to government policy. This research was applied by developing the CIPP evaluation method (Context, Input, Process, Product) designed by Daniel Stufflebeam, the CIPP model is considered to be more comprehensive consisting of of four components, namely: context evaluation : valuation of context, input evaluation : evaluation of input, process evaluation : evaluation to process, and product evaluation : evaluation to results (Stufflebeam & Zhang, 2017). These four components are the target of evaluation and are part of the program. (Zhang, 2017). With, it is hoped that researchers will increasingly and gain an indepth understanding the importance of government policy in optimizing a concept of a geothermal renewable energy development program that starts with the geothermal Work Area bidding program as a substitute for using fossil energy sources in maintaining energy security and independence. . Therefore, the title proposed by researchers in this study is "

Development of Geothermal Working Area Bid Policies to Support Fulfillment of Renewable Energy in the Context of Maintaining National Energy Security ".

Method

In this study using evaluative research design with descriptive qualitative methods. research places. in several namely geothermal development area fields and stakeholder offices such as the National Energy Council (DEN), Ministry of Energy and Mineral Resources (ESDM), Directorate of New, Renewable Energy and Energy Conservation (EBTKE), PT PLN (Persero), Power Plant Development Electricity (PPL)/Independent Power Producer (IPP). The duration of the research conducted by the researcher is 1 (one) calendar year starting from March 1 2021 to October 31 2022. In this study to determine the source of information on the research subjects used a purposive technique. Data collection techniques in this study are interviews, observation, and documentation. The data analysis technique used in this study uses a descriptive evaluative technique, namely an analysis technique by describing data that has been processed, discussed, and evaluated sharply and in detail to produce a conclusion on the data using Nvivo.

Results

The data findings were tested using Nvivo. The following are the results of the analysis test, namely:



Figure 2. Question Scheme

The output results above show that there are five questions posed regarding the development of geothermal working area offerings to support the fulfillment of renewable energy in order to maintain the balance of the national country, namely regarding policy background, policy implementation, concept of regional offering, implementation policy, and policy achievement. After doing the next analysis, the words that are often coded are as follows:



Figure 3. Words that are often coded

Based on the output results above, the words that often appear in Nvivo coding are the words activity, utilization, ministry, development, geology and so on. The final step is to visualize the results of inductive analysis with the NVivo software in the form of visualization models, NVivo graphs or diagrams. The forms of visualization are in accordance with the formulation of the problems and research questions, as follows:



Figure 4. Visualization of Question Results

Based on the results of the analysis above, it shows that out of the five questions asked about the implementation policy, there are at most 6 questions and answers from respondents are more than 3 respondents, so these questions are said to be valid. The question of policy achievement and the policy background of the work area offering each has 5 questions and has answers from more than 3 respondents, so the question is said to be valid. While the question on the concept of work area has 4 answer items and has answers from more than 3 respondents, then the question is said to be valid. And the question with the least number of questions is a policy implementation question which consists of 2 questions and has answers from more than 3 respondents, so the question is said to be valid.

Discussion

Geothermal is a natural resource that has great potential to produce renewable energy. The development of geothermal work area offers is a strategic step that can be taken to maximize the potential of this renewable energy. The following are several steps that can be taken in developing geothermal working area offerings to support the fulfillment of renewable energy and maintain national energy security.

Identify areas that have great geothermal potential. Identification of geothermal potential can be done using geological and geophysical data, as well as conducting field surveys. This can help determine the most potential locations for geothermal energy development. Geothermal working area bidding policy is a policy adopted by the government or related agencies to regulate and facilitate the process of offering geothermal working areas to interested investors or companies. Geothermal policy in the United States began with the California Geothermal Resources Act of 1967 and the Federal Geothermal Steam Act of 1970. Various states later defined geothermal resources as minerals, water, sui generis, heat, or a combination of all (Lund, Falls, & Gordon, 2012). Based on the Nvivo output results, the following analysis results are obtained:



Figure 5. Output of the First Research Question

Based on the output results, it shows that in order to optimize the potential of geothermal resources, the government needs to consider these factors in formulating geothermal work area bidding policies. US geothermal policy has not been consistent as evidenced by peaks and valleys in government funding levels. Since the 1970s, the US federal government has initiated several funding programs to support geothermal energy development. Early programs focused on minimizing or mitigating the financial risks associated with the exploration and development of geothermal resources (Thorsteinsson & Tester, 2010). The results of previous studies show the different interests of the key actors influencing geothermal practices through two opposing coalitions, namely the development and conservation coalitions. In addition, the weak integration and implementation of sciencebased policies has created conflicts that have resulted in deadlocks for geothermal projects in conservation forest areas. Sustainable and integrated policies are needed to resolve conflicts of interest without threatening conservation forests and local communities (Pratiwi & Juerges, 2022) . In addition, the government must also ensure that the policy complies with applicable regulations and does not harm the interests of society and the environment. Some of the factors that form the background to the geothermal working area bidding policy include:

1. Potential Geothermal Resources

The geothermal working area offering policy is carried out to utilize the potential of geothermal resources in the region. Indonesia is a country that has the potential for large and abundant geothermal resources. Therefore, the government took steps to provide opportunities for investors or companies.

2. Government Support

The government as a regulator has an important role in regulating and facilitating the 3493

process of offering geothermal working areas to investors or companies. Government support in the form of clear and transparent policies can accelerate the investment process and minimize risks that may occur.

3. Economic growth

The exploitation of geothermal resources can have a positive impact on the economic growth of a region. Investments made by investors or companies can absorb labor and increase the income of local people.

4. Energy Balancing Efforts

Geothermal energy is a clean and environmentally friendly energy source. By optimizing the use of geothermal energy, it can help reduce dependence on fossil energy sources and make a positive contribution to energy balancing efforts. The policy for implementing geothermal work areas is a policy adopted by the government or related agencies to regulate and facilitate the process of managing geothermal resources in designated work areas. According to Zakkour, Cook, Kato, Bahati, & Kihika (2016), the Uganda National Geothermal Resources Policy provides a written declaration of a framework of objectives and policy statements government that will guide the and stakeholders in the sustainable management of the geothermal industry. Therefore, the Policy is based on the following: objectives, guiding principles, goals and strategies. Based on the Nvivo output results, the following analysis results are obtained:



Figure 6. Second Research Questions

Based on these outputs, it shows that in order to achieve the goal of effective and sustainable management of geothermal resources, the government needs to consider all of the above factors formulating policies in for implementing geothermal work areas. Previous findings suggest that the future development of geothermal energy in AMS will be linked to tax incentive policies and the investment climate in the state (Abidin, Rosdiana, & Solomon, 2020) . In addition, the government must also ensure that these policies continue to be adapted to the latest developments and the dynamics of the local community and environment. The results of previous research show that the results of an analysis of the interests and influence of actors using a political ecology approach show that Pertamina Geothermal Energy, the West Java Natural Resources Conservation Center (BKSDA), BUMN Forestry, the Central Government and the West Java Provincial Government have a large influence. Interest and influence in the management of geothermal energy. So that it is hoped that the Central Government and West Java Province can implement the latest geothermal regulations by encouraging small-scale geothermal management, supervision of the implementation of geothermal management, certainty of permits, production bonuses, establishment of geothermal research and development centers (Fajarudin, Abdoellah, Djuyandi, Widya, & Sumadinata, 2022). Some of the things that need to be considered in formulating policies for the implementation of geothermal work areas are as follows: 1. Geothermal Resource Utilization Regulations

The policy for implementing geothermal working areas must include regulating the use of geothermal resources by considering various aspects, such as technical, economic, social and environmental. The utilization of geothermal resources must be carried out efficiently and sustainably, so as to provide long-term benefits for society and the environment.

2. Licensing and Regulation

The government must provide clear and transparent licensing for investors or companies. The regulations given must pay attention to various aspects, such as technical, security, environmental, and social aspects.

3. Community Engagement

Community involvement must be an integral part of the geothermal work area management policy. The government must prioritize community participation in the decisionmaking process, and ensure that community rights are protected and their interests are considered in every decision made.

4. Monitoring and Evaluation

The government must continuously monitor and evaluate the process of managing geothermal resources in designated work areas. This evaluation can assist the government in determining whether the policies that have been implemented have achieved their goals and provided the expected benefits.

5. HR Development and Development

The government must also provide guidance and human resource development in the field of geothermal resource management. This aims to improve the quality of the workforce involved in the process of managing geothermal resources, so as to optimize the utilization of these resources.

Implementation of geothermal working area policies is the process of implementing policies that have been made by the government or related agencies in regulating and facilitating the process of offering geothermal working areas to investors or companies interested in exploring and exploiting geothermal resources in the area. According to Suryantoro, Dwipa, Ariati, & Darma (2005), the government is willing to bear the risk of upstream development by carrying out various projects related to geothermal energy, including resource surveys, especially for remote areas. Furthermore, the Electricity Law No. 20 of 2002 states that it prioritizes renewable energy including geothermal, to meet sources, domestic electricity needs. The results of previous findings show that the energy policy implemented by the Government in the field of geothermal can be said to be beneficial to the wider community if it meets several basic criteria such as increasing the per capita income of the population, increasing the welfare of the population, reducing the level of social vulnerability and increasing the quality of national resilience (Hermanto, 2018). Based on the Nvivo output results, the following analysis results are obtained:



Figure 8. Third Research Question

The output results also show that in implementing the geothermal working area

policy, the government must pay attention to aspects related to the environment and the interests of the local community. Good policy implementation can have a positive impact on economic growth, development of the energy sector, and people's welfare. The results of previous findings show that economic feasibility is an important factor in the development of geothermal energy. Large initial costs, difficulties in finding resources, and long payback times are the main obstacles in implementing geothermal energy projects (Kombe & Muguthu, 2018). The following are a number of things that need to be considered in implementing the geothermal working area policy:

1. Auction Process

The auction process is an important step in implementing the geothermal working area policy. This process must be carried out in a transparent and open manner to ensure that the investor or company that wins the auction meets the requirements and has the capability.

2. Supervision and Control

The government must ensure that supervision and control are carried out strictly to prevent abuse or violations that may occur.

3. Incentives Giving

The government can provide incentives to accelerate the implementation of geothermal working area policies, such as providing fiscal and non-fiscal incentives for investors or companies investing in the geothermal sector. These incentives can be in the form of tax breaks, capital goods import facilities, and so on. 4. Community Participation and Related Parties

The government must involve the community and related parties in the process of implementing the geothermal working area policy. This participation can be in the form of socialization, consultation, and gathering input from the community and related parties in making decisions related to the implementation of geothermal work area policies.

5. HR Capacity Building

The government must pay attention to increasing the capacity of human resources (HR) involved in implementing geothermal work area policies, whether from the government, investors or companies. Increasing the capacity of human resources can be done through training, coaching, and competency development.

The achievement of the geothermal working area policy can be measured by several indicators such as the number of working areas that have been offered, the amount of incoming investment, and the production of geothermal energy produced. Previous findings suggest that the geothermal industry's goal of achieving commercial production of large-scale baseload geothermal energy in Australia will pay off (Bendall, Huddlestone-Holmes, & Goldstein, 2013). Based on the Nvivo output results, the following analysis results are obtained:



Figure 9. Fourth Research Question

The output results show that in achieving the geothermal working area policy, the government needs to take steps to ensure that all of these factors are met. In addition, the government needs to monitor and evaluate policies that have been implemented periodically to determine their effectiveness and make improvements if necessary. The results of previous research indicate that geothermal energy policy, research, or public awareness communication strategy projects work best when they are integrated with various strategies for behavior change or behavior development, social mobilization, and advocacy that are aimed at achieving clearly identified goals (Okaka, 2016). Thus, it is hoped that the achievement of the geothermal working area policy can continue to increase and have a positive impact on national development. The following are several factors that influence the achievement of the geothermal working area policy:

1. Availability of Work Area

The availability of sufficient working areas and large geothermal resource potential is very important to attract investors or companies. In addition. work areas that have good accessibility and are within the reach of supporting infrastructure such as roads, ports and airports can facilitate the process of transporting and distributing geothermal energy.

2. Supporting Policy

Policies that support and provide legal certainty in the process of procuring, exploring

and exploiting geothermal resources can provide confidence for investors or companies to invest in the area.

3. Availability of Competent Human Resources

A workforce that has competence and skills in the field of geothermal energy is needed to maximize the potential of these resources. Therefore, the government needs to increase investment in workforce education and training that is in accordance with the needs of the geothermal energy industry.

4. Supporting Infrastructure

Supporting infrastructure such as electricity networks, pipelines, and adequate transportation infrastructure are urgently needed to support the exploitation and export of geothermal energy. The availability of adequate infrastructure can also increase efficiency and reduce production costs.

The concept of offering geothermal working areas is the process of proposing or offering working areas that have potential geothermal resources to interested investors or companies. According to Brown (2000) During the period from 1974 to 1995, Los Alamos National Laboratory was actively involved in field testing and demonstrating the Hot Dry Rock (HDR) geothermal energy concept at the Fenton Hill HDR test site in the Jemez Mountains of north-central New Mexico. Based on the Nvivo output results, the following analysis results are obtained:



Figure 10. Fifth Research Question

Based on this output, in the concept of offering geothermal working areas, the government or

related agencies must pay attention to environmental aspects and the sustainability of 3497 natural resources. In addition, cooperation with the local community also needs to be carried out to ensure that it can provide benefits to the surrounding community in a sustainable manner. The previous findings show that based on the expected geothermal potential and general objectives, the preliminary study also provides a rough technical concept outlining how geothermal energy is brought to the surface and distributed to users. If it is planned to supply geothermal energy to residential or commercial buildings, it is equally important to consider existing and new district heating networks as a realistic forecast of future demand and revenue. Peak demand during periods of extreme cold weather usually needs to be supported by gas boilers (Agemar, Weber, & Schulz, 2014). Several things need to be considered in the concept of offering geothermal working areas, including:

1. Identification of Potential Areas

The government or related agencies must identify areas that have potential geothermal resources. It is important to ensure that the work area offered has sufficient potential to generate sustainable energy.

2. Requirements and Criteria

The government or related agencies must establish clear requirements and criteria for bidding on geothermal working areas. This aims to ensure that interested investors or companies meet certain requirements beforehand.

3. Auction Process

The bidding process for geothermal working areas is carried out through an auction process. The government or related agencies must establish a transparent and fair auction mechanism, so as to attract competent investors or companies.

4. Cooperative contract

After the auction process is complete, the government or related agencies must conclude a cooperation contract with the investor or company that has won the auction. This cooperation contract must contain clear provisions regarding the rights and obligations of each party as well as the term of the contract. 5. Monitoring and Evaluation

The government or related agencies must monitor and evaluate the implementation of cooperation contracts to ensure that all agreed terms are met and comply with applicable regulations and standards.

Conclusion

Based on the description above, it can be concluded that the development of geothermal working area offers is very important in supporting the fulfillment of renewable energy and maintaining national energy security. Geothermal is a renewable energy source that is unlimited and reliable because it is continuously produced by the earth naturally. The development of geothermal working area offerings can be carried out through efforts to explore and exploit geothermal potential in Indonesia. In this case, the government can act as a regulator and facilitator to accelerate the development of geothermal working area offers. In addition, the development of geothermal working area offers can also increase local economic development through increased investment and employment. In the long term, the development of renewable energy such as geothermal can reduce dependence on fossil energy and increase national energy security. However, the development of geothermal working area offerings also needs to pay attention to environmental and social aspects. The use of the right technology and good planning can minimize negative impacts on the environment and surrounding communities.

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