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Geothermal Capacity Building Program Indonesia - Netherlands

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Barriers in Indonesia for Direct use of geothermal energy

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1 INTRODUCTION

1.1 BACKGROUND

Indonesia has one of the world's largest geothermal resources. Currently, these geothermal resources are used mainly to produce electricity. Direct use in Indonesia is limited to some small (demo) sites. A market survey has been carried out to identify direct use possibilities in Indonesia. This study shows there is a lot of potential for direct use, mainly in food and agricultural industry. Heat can be used for all kinds of heating and drying processes. In some cases, also large scale industry could benefit from geothermal heat. There are many reasons why direct use is very limited in Indonesia. This reports identifies the main barriers and tries to come up with solutions for these barriers. Some of the identified barriers were mentioned as a barrier for indirect use, but will also be a barrier for direct use.

1.2 METHODOLOGY

The following steps have been performed:

1. Identify barriers, using all kinds of resources, like literature, geothermal conference papers and presentations.
2. Expend list of barriers by organising a workshop, inviting different stakeholders.
3. Expend list of barriers using interviews of different stakeholders.
4. Organise identified barriers in four main categories, namely political, economic, social and technical barriers.
5. Finding solutions to each barrier identified, using input from all resources studied, input from stakeholders (interviews and workshop) and expert judgement.

The results have been summarized in this report. Political, economic, social and technical barriers and there solutions are discussed in chapters 2, 3, 4, and 5 respectively.

Conclusions and recommendations can be found in chapter 6.

2 REGULATORY BARRIERS

2.1 INTRODUCTION

Geothermal projects in general are large and complex, and so are rules and regulations for geothermal energy. Indonesia has a long history in geothermal electricity production (indirect use), but the experience in direct use is limited. This also shows in existing rules and regulations. This chapter deals with regulatory barriers identified.

2.2 REGULATORY BARRIERS

2.2.1 Unavailability of rules and regulations

Many rules and regulations on direct use are unavailable. Both pricing and tax regimes are not regulated yet. At present, geothermal regulations are for indirect use, especially for electricity generation. Therefore, there is uncertainty on geothermal waste heat utilization from existing geothermal power plants and it is difficult for companies to implement direct use of geothermal energy.

Regarding utilization of surface manifestation and ground water associated with geothermal brine for direct use, there is no clear authority between the local governments and the central government.

Solution

The Ministry of Energy and Mineral Resources should develop geothermal direct use regulations on the authorization, licences, financial and fiscal incentives

2.2.2 Multiple governmental bodies

The separation of the regions with authority over the projects causes extra barriers for the direct use market. In some cases it is unclear which governmental body to ask for approval of a project. This can either be the regional, provincial or central government, depending on the location of the geothermal area. Apart from this uncertainty, the approval has to be surpassed by the relevant local governments and the central government, which causes an approval delay and also increases the chance of the rejection of the approval.

Solution

To streamline the process, an one gate office for licences and financing should be developed, as already implemented in other sectors.

2.2.3 Electricity and oil subsidies

The energy market is currently distorted. Subsidies are available for electricity and fossil fuels. This creates an unfair market competition between geothermal energy and fossil energy.

Solution

The energy pricing policy should be reformed by considering environmental aspects. However, for developing countries like Indonesia, the policy should also consider affordability of energy for consumers.

2.2.4 Unawareness of direct use

With the promulgation of the New Geothermal Law in 2014 it became easier for geothermal areas to be developed, since geothermal activities are no longer classified as mining activities and can therefore be developed in reserved forest areas. However, this has a larger impact on the development of projects with indirect use purposes, than on projects with direct use purposes, especially because many direct use projects are limited in size compared to indirect use projects. The activities in areas being developed for direct use can now only be conducted for the use of nature tourism and not for other direct use purposes.

Solution

The government should consider wider social impacts of direct use and small business using clean energy and waste energy.

2.2.5 Lack of incentives

Geothermal direct use is more complex than common forms of heating (wood, fossil etc). Currently, there is a lack of incentives, e.g. economic, legal or sustainable, giving stakeholders no reason to develop geothermal direct use.

Solution

Incentives are essential for stakeholders to develop direct use projects. An important fiscal incentive can be to subsidize geothermal heat use. An exploitation subsidy will make the heat price competitive, but will also make sure that the end user will benefit only when the geothermal system is up and running. Also, an environmental tax on emissions can act as an incentive.

2.2.6 Scattered resource data

Geothermal information and resource data have been scattered through multiple government agencies, universities, nongovernmental organizations and private corporations. This makes it extremely difficult to obtain all available data. This will slow down and increase the cost for geothermal exploration.

Solution

One solution is to centralize all data and make it publicly available. This works very good in the Netherlands. All resource data becomes publicly available after a period of five years. This data can be used for the exploration. In many cases, an exploration drilling is not needed, lowering the exploration cost significantly.

2.2.7 Land acquisition

In Indonesia, most of the projects get delayed or cancelled due to the effect of unclear land planning and speculative land prices. Geothermal prospect areas are often located in areas that are a national park, conservation area or a protected area. When making land available, there are many stakeholders with varied interest. Conflicts arise when there are overlapping of rights on operating areas on one side, and the rights of forestry and people's land on the other side. Overlapping lands and permits and conflicting interest will ultimately delay the activities for development of geothermal resources.

Solution

To tackle this problem, it is important to more strongly enforce Law No 2/2012.

3 ECONOMIC BARRIERS

3.1 INTRODUCTION

Geothermal projects require large investments. Financing geothermal projects is a crucial step in realizing geothermal projects. This chapter deals with economic barriers identified.

3.2 ECONOMIC BARRIERS

3.2.1 Low energy prices

Geothermal energy, both direct and indirect, is hard to develop due to its competition with fossil fuel. Energy prices for fossil fuel are low, limiting the business case. One of the reasons for the low energy prices are the subsidy schemes (see paragraph 2.2.3).

Solution

The energy pricing should be reformed by considering environment cost.

3.2.2 Lack of financing options

Banks have not supported Geothermal development funding because they do not understand geothermal activities clearly, so that Geothermal development investment is still difficult in getting funds. Existing funds are usually not applicable for geothermal direct use. CSR fund is mostly for social activities. None is for funding the utilization of low/medium geothermal energy, like waste heat and sedimentary basins. Government Fund in geothermal field is mostly for geothermal electricity, none has been allocated for direct use of geothermal waste heat.

Solution

One way to solve this problem is to approach banks to get involved. Options for capacity building are e.g. to write a handbook specifically for banks, or to have banks hire geothermal experts for their decision making. Another option might be to look for international funding. Worldwide, there are many banks financing geothermal projects.

3.2.3 Unavailability Geothermal Direct Use Fund

A Geothermal Fund Facility is available, but this fund has not proceeded at sufficient speed to hasten the exploration and development of geothermal resources. Also, there is no fund for direct use of geothermal energy.

Solution

The Government should create Geothermal Direct Use Fund. Green Fund now available in Ministry of Finance may be used in part for direct use of geothermal energy.

3.2.4 Collateral requirements

In case banks are willing to think about funding projects, the requirements usually are very high due to the combination of high risk and high investment of geothermal projects. These high collateral requirements are difficult to meet. Please note that this is mainly an issue when new wells to sedimentary basins have to be drilled. In case of waste heat and/or surface manifestations, investments are considerably less.

Solution

For now, it is best to focus on small scale projects, reducing the required investments as much as possible. After a considerable track record of small scale projects, risks will decrease, paving the way for large scale projects.

3.2.5 Market competition

For a lot of industries, energy production is not their core business. Market competition can act as a barrier. If a company is active in an industry that currently does not have a strong competitive position compared with other countries, the company might be focussing on strengthening their position instead of reconsidering their source of energy.

Solution

When energy production is not the core business, energy production could be outsourced to a third party. This will require long term contracts, both for buying and selling energy.

3.2.6 Distance between heat source and heat demand

Energy must be transported from source to demand. In case of heat, insulated piping is required for transportation. To limit heat losses and high investments, and hence increase the business case, the source must be close to the demand side.

Solution

Industrial activities which use low enthalpy should be relocated or be located near heat sources.

4 SOCIAL BARRIERS

4.1 INTRODUCTION

Geothermal projects can have a large impact on the environment, both during realization and exploitation. This can have great impact on local communities as well. This chapter deals with social barriers identified.

4.2 SOCIAL BARRIERS

4.2.1 Lack of awareness and knowledge

There is a lack of awareness and knowledge about the use of low/medium enthalpy by many involved stakeholders, such as decision makers and local government, financial institutions end users and local communities, but also at geothermal operators. Due to the availability of high enthalpy geothermal energy, all focus is on high enthalpy, while low and medium enthalpy is neglected or seen as complementary.

Solution

Campaigns should be organised to increase the awareness of the importance of direct use of geothermal energy. This could be done through social media, training, workshop and education. Many of these options could be developed in a separate capacity building programme for direct use.

4.2.2 Not-In-My-BackYard syndrome (NIMBY)

Geothermal projects get to deal with the NIMBY syndrome. It cannot be denied that geothermal projects have a great impact on the environment, both during realization and exploitation. During realization, drilling rigs and equipment are required. Piping is required to transport heat either to the power plant or the end user. Also, concerns may arise on the effect of the heat extraction and the risks involved. Because of this, local governments and local communities do have serious concerns about geothermal projects in their backyard.

Solution

Local government, industry and communities should be involved at an early stage. People should be educated about the benefits of geothermal direct use. Preferably, communities should participate in the project, making sure end users and the local community both benefit from the project.

4.2.3 Growth requires more schooled personnel

Geothermal projects, both direct and indirect, are complex projects, requiring highly educated people. Although Indonesia certainly has highly educated people in all required fields, more highly educated people are required to increase the growth of geothermal energy.

Solution

The lack of geothermal (related) educated personnel (human capital) is one of the reasons for the Geocap project to exist. With this project, trainers are trained, so they can pass on knowledge to students, increasing human capital in the near future. Next to Geocap, other capacity building programmes can contribute to the ever growing demand for high educated people. Building up human capital takes time. In the meantime, human capital could be hired from abroad when required. However, to build up knowledge and experience, it is preferable to educate own personnel and students.

4.2.4 Relocation concerns

For both technical and financial reasons, it could be preferable to relocate the demand side closer to the geothermal prospect areas. This, of course, will give concerns, to companies and employees working at the demand side.

Solution

Industry should be made aware of the advantages to relocate their activities near geothermal heat sources. This could give access to long term sustainable, stable and affordable energy, thereby improving industry branding as green company. Also, people nearby will benefit due to increased welfare.

5 TECHNOLOGICAL BARRIERS

5.1 INTRODUCTION

Geothermal projects usually are large and complex projects, requiring high level of knowledge and expertise. This chapter deals with important technological barriers.

5.2 TECHNOLOGICAL BARRIERS

5.2.1 High exploration risk

Geothermal projects have a high exploration risk. The information on the geothermal resource often lacks any subsurface information, making it difficult for bidders to reliably estimate costs. In many cases even basic geology, geochemistry, and geophysics (3G) information is incomplete. Please note that this barrier is mainly applicable in case new wells need to be drilled to sedimentary basins. This barrier does not apply in case of geothermal waste heat and/or surface manifestation.

Solution

Geothermal project need to be de-risked. This should be done by the government. An important aspect is making data available and creating a guarantee fund. This is also done in e.g. the Netherlands. All projects so far have been realised without drilling any exploration wells. However, in areas where there are insufficient data available, slim holes should be drilled to probe for geothermal resources.

5.2.2 Lack of standards and guidelines

There is a lack of clear global guidelines and standards for determining the potential of geothermal energy. This is holding back the assessment of geothermal energy.

Solution

There should come a global classification for geothermal resources, especially for low and medium enthalpy such as surface manifestation, geothermal waste heat and sedimentary basins.

5.2.3 Lack of project coordination

Geothermal projects are large and complex. Many stakeholders in many sectors are involved. Across sector coordination is important for the project to succeed. For correct integration of the geothermal energy source into the demand side, knowledge on both subsurface and surface aspects is required.

Solution

There should be improved project coordination for implementation of utilization of low enthalpy originated from surface manifestation, geothermal waste heat and sedimentary basins.

5.2.4 Sub-optimal system performance

System performance may be sub-optimal, due to conflicting incentives of developers and contractors.

Solution

Apply Due Dilligence as stipulated by MEMR Regulation No. 3/2015.

5.2.5 Lack of general infrastructure

Geothermal prospects in many cases are in remote areas. Large drilling rigs and all kinds of auxiliary equipment are required for drilling geothermal wells. In many cases, general infrastructure to get all this equipment to the geothermal prospect area is not present. However, for direct use of geothermal energy, the general infrastructure required is to support certainty of low enthalpy supply.

Solution

The Government should create regulations to ascertain the availability of low and medium geothermal enthalpy supply for users at an affordable price.

6 CONCLUSIONS & RECOMMENDATIONS

6.1 CONCLUSIONS

- Regulatory aspect. There is unavailability of regulations on geothermal direct use, i.e. energy pricing and tax regimes, no clear authority between the local governments and the central government on ground water associated with geothermal brine and unawareness of direct use.
- Economic aspect. The main barriers are low energy prices, **lack of financing capability and** high infrastructure investment connecting heat sources and users.
- Social aspect. The main barriers are lack of awareness and knowledge, Not-In-My-BackYard syndrome (NIMBY) and lack of capacity building
- Technological aspect. The main barriers are lack of standards and guidelines, lack of project coordination, sub-optimal system performance and lack of general infrastructure.

6.2 RECOMMENDATIONS

Regulations aspect

- Develop geothermal direct use regulations on the authorization, licences, financial and fiscal incentives
- Develop one gate office for licences and financing as already implemented in other sectors.
- Reform energy pricing policy by considering environmental aspects. However, for developing country like Indonesia, the policy should also consider affordability of energy consumers.
- Consider wider social impacts of small business using clean and waste energy

Economic aspect

- Reform energy pricing by considering environment cost.
- Approach banks to get involved.
- Create Geothermal Direct Use Fund.

- Relocate or locate industrial activities which use low enthalpy to be near heat sources

Social aspect

- Intensify campaign awareness the importance of direct use of geothermal energy through social media, training, workshop and education
- Involve local government, industry and communities at an early stage, make sure end users also benefit from project, preferably by participating in the project, educate people.
- Improve capacity building of people involved in geothermal direct use projects through training, workshops, and education.
- Attract small industry to relocate or locate their activities near heat source thereby improving industry branding as green company and benefiting people nearby for social welfare

Technological aspect

- Improve data classification of geothermal resources especially for low enthalpy such as surface manifestation, waste heat and hot aquifer
- Improve project coordination for implementation of utilization of low enthalpy originated from surface manifestation, waste heat and hot aquifer
- Apply Due Dilligence as stipulated by MEMR Regulation No. 3/2015
- Create regulations to ascertain the availability of enthalpy supply for users with affordable price.