GEOCAP
Geothermal Capacity Building Program Indonesia - Netherlands

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Plan of approach Jababeka Industrial Estate

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1 PREFACE

1.1 INTRODUCTION

Based on a geothermal resource assessment and market survey, promising targets for development were identified. The focus for identification was on direct use projects. One of these identified targets is Jababeka Industrial Estate. This case is worked out in more detail in this study. Within Geocap also important political, financial, social and technical barriers for direct use projects were identified.

1.2 OBJECTIVE

In this study, a case specific analyses is carried out for Jababeka Industrial Estate. A plan of approach for realization will be made. This plan of approach could, in many ways, also be used for comparable projects, although deviations may occur due to case specific circumstances.

1.3 READING GUIDE

The Jababeka Industrial Estate case is described in chapter 2. In chapter 3, a plan of approach is described on how to realize geothermal direct use at Jababeka. Some steps already have been carried out under Geocap. An update on the status is given in chapter 4.

2 CASE DESCRIPTION

2.1 INTRODUCTION

Under Geocap, a quick scan has been carried out for Jababeka industrial estate. This chapter gives a summary of this analyses. For more details, the reader is referred to the quick scan report[1].

2.2 LOCATION

Jababeka Industrial Estate is a modern eco-industrial estate, situated in Bekasi. It spans more than 2,000 hectares and has more than 1,650 local and international companies. The power plant of Cikarang Listrindo supplies power to the estate.

Figure 1: Location of Jababeka Industrial Estate (orange circle)

[1] N. Putri & J.H. Kleinlugtenbelt, Quick scan Jababeka Industrial Estate, GEOCAP-20171206/REP/IF – ITB/WP3.6, December 2017

2.3 HEAT DEMAND

Potential heat customers and their estimated heat demand are shown in Figure 2 and Table 1 respectively.

Figure 2: Location potential heat customers

Customer	Type	Temperature	Capacity	Demand
		[°C]	[MWt]	[MWht]
Unilever	Food and consumer goods	100	15	120,000
L'Oreal	Consumer goods	70	10	80,000
Fajar Paper	Pulp and paper	110	10	80,000
Fajar Paper	Pulp and paper	160	25	200,000

Table 1: Estimated heat capacity and demand

2.4 GEOTHERMAL POTENTIAL

At the location of Jababeka Industrial Estate, the West Java Basin is present and has high geothermal potential. More details about the geothermal potential can be found in te Geocap resource assessment report[2] and the Jababeka Quick scan. A summary of the estimated potential is given in Table 2.

Well	Unit	Value
Depth	mTVD	2,600
Flow	m3/h	400
Temperature	°C	135

Table 2: Estimated potential West Java Basin at Jababeka Industrial Estate

2.5 ENERGY CONCEPT

A schematic overview of the energy concept is shown in Figure 3. Three options have been studied: geothermal hot water production, geothermal 110°C steam production or a combination of both.

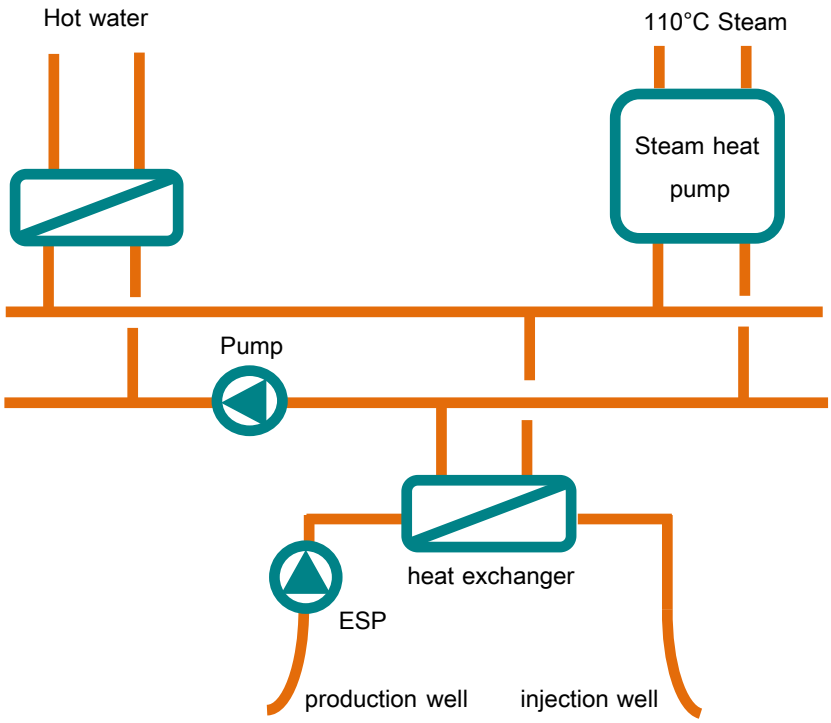

Figure 3: Schematic overview energy concept geothermal energy at Jababeka

[2] S.D.H. Putra et al., WP3.01 Resource assessment, GEOCAP-20160131-REP-ITB-WP3.01, 2016

2.6 SUSTAINABILITY

Using geothermal heat for hot water and steam production, CO2 emissions are reduced. A summary is given in Figure 4.

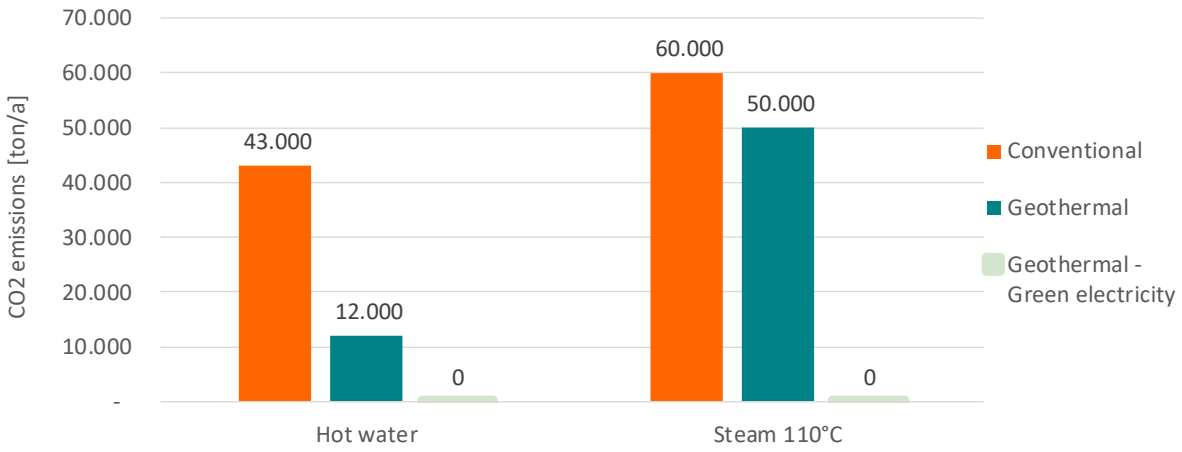

Figure 4: CO2 emissions for geothermal hot water and 110°C steam production.

2.7 FINANCIAL ANALYSES

Results of the financial analysis are summarized in Table 3.

		Hot water case	Steam 110°C case
CAPEX	$	28,500,000	50,800,000
OPEX	$/year	1,900,000	6,900,000
Revenues	$/year	6,000,000	11,000,000
Income	$/year	4,100,000	4,000,000
Payback period	year	7	13

Table 3: Summary financial analysis

3 PLAN OF APPROACH

This chapter gives a plan of approach on how to possibly realize a geothermal direct use project for Jababeka Industrial Estate. For a geothermal direct use project, the following phases can be distinguished:

- Phase I: Preliminary Survey
- Phase II: Exploration
- Phase III: Project review and planning
- Phase IV: Realization
- Phase V: Exploitation
- Phase VI: Abandonment

3.1 PHASE I: PRELIMINARY SURVEY

In the preliminary survey, first steps are made to identify opportunities and work out a case on a quick scan level. Steps performed consist of:

- Quick scan: based on the resource assessment and market survey, high potential projects have been identified. The high potential projects have been worked out in more detail in quick scans. Results of the quick scan for the Jababeka case are already summarized in chapter 2.
- First stakeholder session: in case of a positive quick scan, important stakeholders will be identified. A quick scan can be considered positive in case of a positive business case and/or improved sustainability. Identified stakeholders will be contacted and a workshop setup to introduce the project. This step has already been done during Geocap (see chapter 4 for more details).
- Data inventory and collection: inventory and collection of available (geothermal) data.
- Update quick scan: using info and incentives directly supplied by the stakeholders, the quick scan will be updated.
- Project organisation: In case of a positive quick scan, a more detailed project organisation and planning will be made, describing responsibilities and important milestones.
- Financing: using the results of the quick scan, possibilities for financing will be investigated.

- Environmental impact assessment (EIA): a first setup of the environmental impact assessment is made.
- Communication plan: a communication plan is made.
- Permits: required permits will be identified and secured.

3.2 PHASE II: EXPLORATION

- Seismic data acquisition/reprocessing: this step is case specific. Depending on the data inventory and collection earlier in the preliminary survey, new seismic data or reprocessing of existing data may be required to further detail the geological study.
- Geological study: existing data and/or new data will be studied in more detail. This is a combination of geological, geophysical and geochemical analyses. A geological model is made to predict the expected capacity and distribution curve.
- Risk assessment: risks are identified as well as mitigation measures.
- Preliminary design: a preliminary design of surface and subsurface installations are made.
- Update business case: using the results of the geological study and preliminary design, the business case is updated.
- Contracting: initial contracts are made about heat supply and heat off take
- Financing: details about financing are finalized. This may include grants and subsidies.
- Permits: if required, additional permits are secured.

3.3 PHASE III: DEVELOPMENT

- Final EIA: the Environmental Impact Assessment is finalized.
- Drilling plan: a drilling plan for drilling both production and injection well is made. The drilling plan will be evaluated before drilling commences by relevant authorities.
- Detailed design: detailed designs are made for all surface and subsurface installations.
- Tendering: all equipment and work will be tendered.
- Contracting: contracts about heat supply and heat off take are finalized
- Financial Closure: A final Investment Decision is made and a funding agreement is signed between all relevant stakeholders.

3.4 PHASE IV: REALISATION

- Drill site preparation:
- Drilling and testing: both production well and injection well are drilled. Drilling will occur subsequently and each well will be tested as soon as possible after drilling. If the first well is successful, the second well will be drilled.
- Update reservoir model: using data acquired at drilling, the reservoir model will be updated.
- Construction: the heating grid and all required surface components are constructed.
- Start-up and commissioning: in the start-up, the complete system is tested and technical issues have to be solved. Performance (efficiency) as a whole is tested.

3.5 PHASE V: EXPLOITATION

- Operation and maintenance: during exploitation, all equipment will be operated and maintained. Scheduled maintenance will be carried out. Unexpected technical problems will be resolved on an ad hoc basis.

3.6 PHASE 6: ABANDONMENT

- Workplan: a workplan for the abandonment is made
- Permits: required permits for abandonment of wells are secured.
- Abandonment: wells are closed and partly removed.

4 CASE UPDATE

The quick scan for Jababeka (see summary in chapter 2) shows that a payback period of 7 years seems possible. With the added value of sustainable heat, this looks promising. The next step is to identify and contact stakeholders. Identified stakeholders are discussed in paragraph 4.1. Results of the first stakeholder sessions are summarized in paragraph 4.2.

4.1 STAKEHOLDERS JABABEKA CASE

The project is in the first stage of the development phase (quick scan in the preliminary survey). In the preliminary survey, relevant stakeholders are heat off takers, authorities, geothermal operators, project developers and the local community. These stakeholders are discussed briefly in the following paragraphs.

4.1.1 Heat off takers

A wide variety of industry is located at Jababeka Industrial Estate. In a quick scan, potential heat off takers were identified (see also paragraph 2.3). Identified heat off takers are:

- Unilever: produces food and consumer goods. A lot of these processes will require low temperature heat. A temperature requirement of 100°C is estimated. This needs to be verified with Unilever.
- L'Oreal: produces consumer goods. A lot of these processes will require low temperature heat. A temperature requirement of 70°C is estimated. This needs to be verified with L'Oreal.
- Fajar Paper: produces pulp and paper. A lot of these processes will require low temperature steam. A temperature requirement of 110-160°C is estimated. This needs to be verified with Fajar Paper.

It is likely that there are more potential heat off takers. It is recommended to discuss this with Jababeka Industrial Estate since they will have more detailed information about all industry situated at Jababeka Industrial Estate.

4.1.2 Authorities

Relevant authorities can be subdivided into central and local government. In the entire process, many authorities will be involved, but in this case, the most important authorities are mentioned.

Central government

- MEMR: The ministry of Energy and Mineral Resources is responsible for the national energy policy.
- EBTKE: The Directorate General of New Renewable Energy and Energy Conservation is responsible for formulating and implementing policies in their sector, as well as preparing norms and standards. They are also responsible for managing the pre-survey activities and tendering of geothermal areas.

Local government

- Bekasi: Jababeka Industrial Estate is situated in the Bekasi Regency. For geothermal direct use projects, both local and central government will be involved. Local government must be involved from the start of the project.
- West Java Geothermal Centre of Excellence: Jababeka Industrial Estate is situated in West Java. The Geothermal Centre of Excellence can assist other (local) authorities in decision making.

4.1.3 Geothermal operator (and developer)

The geothermal system needs to be developed and operated by a geothermal operator. In Indonesia, there are both state owned and private geothermal operators.

State owned geothermal operators/developers (examples)

- PT Pertamina Geothermal Energy
- PT Geo Dipa Energy

Private geothermal operators/developers (examples)

- PT Star Energy
- PT Supreme Energy

More operators and developers can be found in the Geothermal Handbook for Indonesia

4.1.4 Project developer/operator

- PT Cikarang Listrindo: is responsible for electricity production at Jababaka Industrial Estate. Electricity is produced with gas turbines and then distributed to customers

situated at the Industrial Estates. A new role for PT Cikarang Listrindo could be to transport and sell heat to customers as well. Geothermal heat could be bought form the geothermal operator. They would be a linking pin between customers and the geothermal operator, making them a good candidate to act as project developer and (thermal grid) operator.

- Jababeka Industrial Estate: they are responsible for running the industrial estate. Together with PT Cikarang Listrindo, they could develop the project.

4.1.5 Local community

- Citizens: All nearby citizens should be involved in the communication about the project. Important aspects are safety, environmental impact and noise due to 24/7 drilling activities.
- Industry: all industry situated at Jababeka will have high value assets on the industrial estate. Even if they do not need geothermal heat, they still should be involved in the communication about the project status, identified risks and mitigation measures.

4.2 STAKEHOLDER SESSION

During Geocap, a workshop was prepared (Work Pacakage 3.5). The idea of this workshop was to share the quick scan results with stakeholders and determine the next steps together with the stakeholders.

The Jababeka Industrial Estate case was one of the selected cases. Several stakeholders were contacted. Please note that in some cases, contact information could not be found.

- Unilever: was invited to the workshop. They showed interest in the quick scan results, and signed up for the workshop. However, they did not attend the workshop.
- L'Oreal: was invited to the workshop. They showed interest in the quick scan results, and signed up for the workshop. However, they did not attend the workshop.
- Jababeka Industrial Estate: were contacted. In a response to the email they stated that geothermal heat cannot compete with gas fired boilers and therefore have no interest in investigating this option any further.
- EBTKE: were invited and also gave a presentation at the workshop.
- Indonesia Geothermal Centre of Excellence: were invited and participated in the workshop.

- PT Geodippa: As a geothermal developer/operator, they are interested in geothermal direct use. They attended and participated in the workshop.

In the Jababeka Industrial Estate, authorities and supply side (geothermal developers) show interest in geothermal direct use. On the demand side however, there is almost no interest. A major reasons for this lack of interest is that common heat production (fossil fuels) is relatively cheap. Even although there is a payback period for direct use, the savings are considered insufficient. Most likely, there will be other reasons as well, but since the demand did not show up on the workshop, other reasons can only be guessed.

4.3 BARRIERS

During Geocap, important barriers were identified, together with possible solutions in work package 3.3. Low energy cost for fossil fuels was identified as an important barrier. One of the reasons for low fossil fuel prices is because of the current subsidy scheme. This need to be changed to create a more level playing field for geothermal heat.

5 CONCLUSIONS & RECOMMENDATIONS

5.1 CONCLUSIONS

- Technically, low and medium enthalpy geothermal heat can be used to supply industry with renewable hot water and/or steam.
- Authorities and geothermal developers/operators show interest in geothermal direct use.
- End users have no interest in geothermal heat due to low prices for fossil heat.

5.2 RECOMMENDATIONS

- A first step is for the central government to change the subsidy schemes for energy in such a way that a level playing field is created for all energy options.
- Stronger sustainability incentives should be created by the government to stimulate (geothermal) renewable direct use production.
- Another reason for the lack of interest could be a lack of knowledge on geothermal direct use. In that case, a stakeholder session can be of great impact, informing end users about the technique and its advantages. It is recommended that a new attempt is made to set up a stakeholder session, preferably initiated by the central government.

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