Geothermal Direct Use in Dieng, Indonesia

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Introduction

Rationale

Brief of Dieng Data

Study on Direct Use in Dieng (Resources, Market Assessment, Challenge and Timeline)

Strategic Values
Introduction

1. Located on Indonesia

2. PT Geo Dipa Energi (GDE) is SOE (State-Owned Company) as geothermal developer

3. Project D2P2 initiates on 2019

4. Source of funds for Dieng 2 & Patuha 2 (D2P2) are equity, ADB and CTF

5. Each unit of D2P2 has net capacity 55 MW

6. Dieng Unit 1 already operated since 2002 with generated power 60 MW
Rationale

Geothermal direct use is the utilization of geothermal energy by using the heat to add value of commodity.

Direct use worldwide implement many viable applications and sustainable O&M such as Blue Lagoon, Iceland.

Direct use in Indonesia has many challenges so that the progress looks stagnant such as the Masarang palm sugar.

Pre-Feasibility Study for Direct Use Dieng & Patuha finished on March 2019.

These study indicates direct use focused on Dieng due to the feasibility of resources and market.

Dieng area need engagement with the community especially through geothermal related activities.
### Brief of Dieng Area

<table>
<thead>
<tr>
<th>Mountainous area located on elevation &gt; 1500 masl, average ambient temperature 14° to 23°C. Lowest at -9 °C on June 2019</th>
<th>Majority livelihood as a farmer, home industries related to agricultural and small medium enterprises related to tourism</th>
<th>Potential agricultural commodity consist of potato, carica, carrot, and herbal roots</th>
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<tbody>
<tr>
<td>Tourism attractive area such as Telaga Warna, Sikidang Crater, Arjuna Temple, Sikunir Hill, etc</td>
<td>Has annual event called Dieng Culture Festival with more than 150,000 visitors in 2019</td>
<td>10 (ten) villages on 2 (two) District relate to the development of expansion unit</td>
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Resources (Geothermal Fluids) in Dieng

**Manifestation**
1. Sikidang crater has temperature approx. 90 °C with pH 2-3
2. Sileri crater has temperature approx. 80 °C with pH 6
3. Siglagah spring has temperature 70 °C with pH 6-7
4. Sipandu spring temperature approx. 80 °C with pH 6-7
5. Bitingan spring temperature approx. 65 °C with pH 6-7

**Waste Heat**
1. Brine from outlet separator T= 180 °C
2. Condensate from power plant

* means normally the fluids injected through injection wells

**Drilling Well**
1. Not applicable

Most attractive
Random sampling from more than 30 homestay

Majority of homestay has 5-10 rooms, approx. 30% of the homestay has more than 10 rooms

Currently using LPG as energy source for heater with estimated 8 kg/month/room equal to Rp 100,000

Potentially use the heat from geothermal fluids and transferred to fresh water for space heating and water heating.
Market Assessment (Agricultural Processing)

- Dieng has massive production of potato and carica.
- Findings on medium enterprises which process potato and carica
- Currently using LPG as energy source for boiling or drying the food with estimated
- Final product estimated

Wonosobo District produce 300 ton/year
8 Small Medium Enterprises
9 - 600 kg/month
0.5 - 5 ton/month
Proposed Programme

Priority Programme

Based on Pre-FS which is technically acceptable & financially viable

1. Homestay (space and water heating)
2. Balneology / pools
3. Agroindustry (Carica Processing)

Other Ideas

To be considered

1. Greenhouse
2. Coffee drying
# Result of Pre FS Direct Use

<table>
<thead>
<tr>
<th>No</th>
<th>Sector</th>
<th>Business</th>
<th>Purposes</th>
<th>Demand</th>
<th>Target</th>
<th>Financial</th>
</tr>
</thead>
</table>
| 1  | Tourism| Hotel/Home stay | Space heating and water heating | Fresh warm water with $T = 50 - 60^\circ C$ | Hotel/Home stay/Home | TOTAL CAPEX 0.46 M USD  
Proposed thermal tariff 0.51 cent USD/kWt  
IRR 22%  
PBP 11 years |
| 2  | Tourism| Balneology/Swimming pool/Spa | Water heating | Fresh warm water at $T = 40 - 50^\circ C$ | Cooperation with tourism |
| 3  | Industry| Processed Candied Carica | 1. Blanching | Blanching temperature 82$^\circ$C-93$^\circ$C for 3-5 minutes | Carica production for Wonosobo and SME |
|    |        |          | 2. Soaking | Hot water/air to maintain sugar solution at 60 - 65$^\circ$C |  
|    |        |          | 3. Sterilization | Air/water $T = 121^\circ C$ for 15 minutes |  |
|    |        | Processed for skincare | 1. Drying | 1. Hot air with $T = 55^\circ C$ | Cooperation with NZ government |
|    |        |          | 2. Mixing | 2. Hot air with $T = 70^\circ C$ |  |
Challenges

1. Cooperation scheme with local government or enterprises

2. To be confirmed about the Direct Use License (Ijin Pemanfaatan Langsung / IPL) from Ministry of Energy and Mineral Resources or other related license document as per regulation

3. Communication to community (acceptance)

4. Sustainable Operation and Maintenance (O&M) which is not interfere the power plant
Timeline

**Activities**
- Pre-Feasibility Study on Direct Use Dieng & Patuha
- Update Feasibility Study
- Direct Use License?
- Construct

**Responsibilities**
- Consultant BLU P3TEK
- PMU
- PMC
- PMC
- PMC
- Construct or

**Result**
- Selected or recommended application
- Detail Design
- Cost Estimate
- Bid Doc
- Turn Key
- O&M manual

**Pre-Feasibility Study on Direct Use Dieng & Patuha**

**Update Feasibility Study**

**Direct Use License?**

**Construct**

**Selected or recommended application**

**Detail Design**

**Cost Estimate**

**Bid Doc**

**Turn Key**

**O&M manual**
Strategic Value

**Society**
- Effected to economical of surrounding society by the increasing the job opportunity which may affect the prosperity and purchasing power
- Enhance the sense of belonging of geothermal to the society

**Environmental**
- The utilization of geothermal will decrease fossil fuel utilization
- Increasing the National Determined Contribution in greenhouse gas emission (Paris Agreement)

**Government**
- Synergy with local government to optimize the utilization of geothermal especially direct use
- By the increasing of tourism may has multiplier effect to economic sector also affect the tax increases
- To be discussed as per regulation
Thank you
Layout of Dieng

Well, SAGS, & Power Plant
PLTP Dieng Unit-2
WKP Dataran Tinggi Dieng

Legend
- Unit 2 - Injection Well
- Unit 2 - Production Well
- Transmission Line
- Unit 2 - Steam Line
- Unit 2 - Steam Line
- Road
- PLTP Unit 2
- Substation Dieng
- PLTP Unit 1
- DKG Well
- HCE Well
- Topography

Well pad (Separator)
Power Plant
Lindal Diagram