CURRENT OUTLOOK ON GEOTHERMAL IN INDONESIA

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Outline

- Overview on geothermal Resources in Indonesia
- Currents Status
- Updates on the current & planned installed capacity in Indonesia
- Overview on the current issues & opportunities
- Conclusion
Overview on geothermal Resources in Indonesia
Located in Ring of Fire, Indonesia’s Geothermal resources may account for 40% of global potential

- 276 existing and potential resources
- GOI estimates up to 28.99 GW of Geothermal potential (2010)

Number of Geothermal Location : 276
Total potential : 28.99 GW (Status end of 2010)
Success Story: Indonesia Experience

- 1974: Geothermal exploration (PD 16)
- 2003: Law 27/2003 on Geothermal
- 2007: GR No.59/2007 on Geothermal Business Activities

CER REVENUE:
- 1 Project has fully success through Emission Reduction Purchase Agreement with the amount of USD127 Millions until 2012
- 3 Others projects are under assessed for CER with the amount of USD30 millions until 2012.
Currents Status
Geothermal Status (2010)

- **32.61%** Detail ± Gradient Temp (90 locations)
- **2.90%** Feasibility Study/Ready to Develop (8 locations)
- **7.97%** Preliminary Survey (22 locations)
- **2.54%** Installed (7 locations)
- **53.99%** Reconnaissance (149 locations)

Total Locations: 276
Current Status

Geothermal Potential is more than 28,000 MW

Installed Capacities is 1196 MW:

- **Darajat** – 260 MW (2005: 150 MW)
- **Dieng** – 60 MW (2005: 60 MW)
- **Kamojang** – 200 MW (2005: 140 MW)
- **Gunung Salak** – 377 MW (2005: 345 MW)
- **Sibayak** – 12 MW (2005: 2 MW)
- **Lahendong** – 60 MW (2005: 20 MW)

Some direct use are under research program and some others are in utilized

Geothermal Road Map: increase to 9500 MW on 2025

Current crash program 10,000 MW project: 40% geothermal of 10,000 MW IPP

18 Geothermal Existing Area, 15 operated by Pertamina, 3 by others incl. PLN.

New GWA:

- 15 Permit have been issued
- 6 Area under progress of bidding (Ref. GR 59/2007)
- Others are prepared for tender to support PD No.4/2010
Total Install Capacity: 1196 MW (4%)
Geothermal Direct use

- Palm sugar processing in Lahendong
- Copra drying in Lahendong, Mataloko and Wai Ratai Lampung,
- Mushroom cultivation in Kamojang and Pengalengan,
- Tea drying and pasteurization in Pengalengan.
- Fish farming in Lampung.
- Balneology, spas

No heat Pump use so far
Direct uses for Spa:

1. **Ciater**
   *Swimming Pool at Ciater, Bandung, West Java*
   Temperature: 43-46 Celcius

![Swimming Pool at Ciater, Bandung](image)
2. Swimming Pool in Cipanas, Garut, West Java
Temperature : 49 Deg C
3. Spas at Cibodas – Karaha, Traditional
4. Masarang Palm Sugar Processing in Lahendong, North Sulawesi. Steam consumption: 4 ton/hrs

- Palm sugar processing unit using 4 tonnes/hour brine from Lahendong geothermal power plant
Lahendong
White Copra Processing
Flow Rate : 50 ton / hrs
Pressure : 1 – 8 kg / cm²
Temperature : ~ 90 - 175 °C
Lampung
Fish Farming in Lampung, South Sumatra
Lampung

Copra Processing in Wai Ratai Lampung, South Sumatra
Mushroom Cultivation
Location: Kamojang, West Java
Flow rate: 4 ton / hrs
Pangalengan
Champignon Mushroom and Potatoes Cultivation
Location: Pangalengan, West Java
Temperature: 60 – 80 Deg C

- Tea Drying & Pasteurisation
Updates on the current & planned installed capacity in Indonesia
Installed capacity MWe
2004 - 2011

USA 2544 MW
PHILIPPINES 1931 MW
INDONESIA 1196 MW
MEXICO 953 MW
ITALY 790 MW

GOAL
9500 MWe
Tahun 2025
GEOTHERMAL ROAD MAP 2004 - 2025

- 2004: 822 MW (production)
- 2008: 2000 MW
- 2010: 3442 MW
- 2012: 4600 MW
- 2016: 6000 MW (target)
- 2020: 9000 MW (target)

- 2004: 1193 MW Existing WKP
- 2008: 1442 MW Existing WKP
- 2010: 1158 MW Existing WKP + New WKP
- 2016: 1400 MW New WKP

Geothermal Road - map
Geothermal to play an increasing role in energy mix

Primary Energy Year 2025 (BaU Scenario)
2008 (148 TWh)

Primary Energy Year 2025 (Scenario PD No.5/2006)
2018 (365 TWh)
<table>
<thead>
<tr>
<th>No.</th>
<th>Company Operated</th>
<th>Geothermal Area</th>
<th>Contract Signed</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Pertamina (PGE)</td>
<td>Kamojang (WKP - Kamojang - Darajat, Bandung - Jawa Barat)</td>
<td>31-12-1992, Restructured 07-08-2003</td>
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<td>4</td>
<td>KOB Pertamina (PGE) dan Konsorsium Medco (SOL)</td>
<td>Sarulla - Sibual buali (Sumatera Utara)</td>
<td>27-02-1993, Restructured 2008</td>
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<td>5</td>
<td>Geo Dipa Energy</td>
<td>WKP Dieng (Pertamina - PGE)</td>
<td>2-12-1994, Resetlement 12-11-2003</td>
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<tr>
<td>7</td>
<td>Star Energy Wayang Windu Geothermal Ltd</td>
<td>Wayang Windu (WKP Pengalengan Pertamina - PGE)</td>
<td>2-12-1994, Restructured and restlement 2004</td>
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<td>8</td>
<td>Pertamina (PGE)</td>
<td>Karaha - telaga Badas (ex Karahabodas Company), WKP karaha Cakrabuana</td>
<td>2-12-1994,</td>
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<td>9</td>
<td>KOB - Pertamin (PGE) dan Bali Energy limited</td>
<td>Bedugul , Bali (WKP Tabanan, Bali)</td>
<td>17-12-1995, Restructured 7-8-2003</td>
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<td>10</td>
<td>Pertamina (PGE) dan Dizamatra Powerindo</td>
<td>Sibayak, Sumatra Utara (WKP Sibayak - Sinabung, Sumut)</td>
<td>15-01-1996, Restructured 2004</td>
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<td>11</td>
<td>Pertamina (PGE)</td>
<td>Lahendong - Tompaso, Sulawesi Utara (WKP Lahendong - Sulut)</td>
<td>June. 2003</td>
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<td>12</td>
<td>Pertamina (PGE)</td>
<td>Kotamobagu, Sulawesi Utara (WKP Kotamobagu, Sulut)</td>
<td>Pre 2003</td>
</tr>
<tr>
<td>13</td>
<td>Pertamina (PGE)</td>
<td>Ulu Belu, Lampung (WKP Way Panas, lampung)</td>
<td>Pre 2003</td>
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<td>14</td>
<td>Pertamina (PGE)</td>
<td>Hulu Lais, bengkulu (WKP Hulu Lais, bengkulu)</td>
<td>Pre 2003</td>
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<td>15</td>
<td>Pertamina (PGE)</td>
<td>Lumut Balai, Sumatra selatan (WKP Lumut Balai, Sumsel)</td>
<td>Pre 2003</td>
</tr>
<tr>
<td>16</td>
<td>Pertamina (PGE)</td>
<td>Sungai penuh, Jambi (WKP Sungai Penuh, jambi)</td>
<td>Pre 2003</td>
</tr>
<tr>
<td>17</td>
<td>Pertamina (PGE)</td>
<td>Iyang - Argopuro, Jawa Timur (WKP Iyang - Argopuro, Jatim)</td>
<td>Pre 2003</td>
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<td>18</td>
<td>Wahana Sambada sakti</td>
<td>Ciater, Jawa barat (WKP Ciater, Jabar)</td>
<td>Pre 2003</td>
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<td>19</td>
<td>Yala - Teknosa</td>
<td>Cibuni, Jawa Barat (WKP Cibuni - Patuha)</td>
<td>Pre 2003</td>
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<td>20</td>
<td>PT PLN</td>
<td>Tulehu, Ambon, Kab. Maluku Tengah</td>
<td>Pre 2003</td>
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<tr>
<td>Project</td>
<td>Location</td>
<td>Status</td>
<td></td>
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<tr>
<td>21 Star Energy Geothermal Halmahera</td>
<td>Jilolo, Halmahera - Maluku Utara</td>
<td>IUP 2009</td>
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<td>22 PT Jabar Rekind Geothermal</td>
<td>Cisolok - Cisukarame, Jawa Barat</td>
<td>IUP 2009</td>
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<td>PT Supreme Energy Muaralabo, Sumatra Barat</td>
<td>Liki-Piangawan, Muaralaboh, Sumbar</td>
<td>IUP 2009</td>
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<td>24 PT Supreme Energy Rajabasa</td>
<td>Gunung Rajabasa, Lampung</td>
<td>IUP 2010</td>
<td></td>
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<tr>
<td>25 PT Sabang Geothermal Energy</td>
<td>Jaboi, Sabang, Aceh</td>
<td>IUP 2010</td>
<td></td>
</tr>
<tr>
<td>26 PT Giri Indah Sejahtera</td>
<td>Gunung Ungaran, Jawa Tengah</td>
<td>In the process of IUP</td>
<td></td>
</tr>
<tr>
<td>27 PT WIKA jabar Power</td>
<td>Gunung Tampomas</td>
<td>IUP 2009</td>
<td></td>
</tr>
<tr>
<td>28 PT PLN</td>
<td>Ulumbu, Flores, Kab. Manggarai tengah, NTT</td>
<td>In the process of IUP</td>
<td></td>
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</table>
Overview on the current issues
GOI Commitment on geothermal...
NATIONAL COMMITMENT ON CER

Commitment of the President of Indonesia to G-20 Pittsburgh and COP15 to reduce Carbon Emission at 2020

National effort

Forestry, Gambut, Agriculture
Energy sector
Waste
Industry and Transportation

<table>
<thead>
<tr>
<th>Category</th>
<th>Emission (Ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry, Gambut, Agriculture</td>
<td>680 mio</td>
</tr>
<tr>
<td>Energy sector</td>
<td>30 mio</td>
</tr>
<tr>
<td>Waste</td>
<td>48 mio</td>
</tr>
<tr>
<td>Industry and Transportation</td>
<td>9 mio</td>
</tr>
</tbody>
</table>

RE and energy conservation

National effort and internasional support

26% (767 jt Ton)

41%
Indonesian Paradigm on Energy Resources

Abundance of Resources?
No, because Indonesian Energy Resources is limited compared to the world:

- Oil: 0.5% of world resources
- Gas: 1.4% of world resources
- Coal: 3.1% of world resources
- Geothermal: 40% of world resources

While:

- Indonesia population is the 4th biggest in the world
Geothermal, alternative v.s priority of choices

INDONESIAN GEOTHERMAL POTENTIAL

END OF 2003
SPECULATIVE = 9.467.5 MWe
HYPOTHETIC = 4.613 MWe
POSSIBLE = 10.027 MWe
PROBABLE = 728 MWe
PROVEN = 2.305 MWe
TOTAL = 27.140.5 MWe
PARADIGM SHIFT OF RE FOR 25/25

Current (2010):
- In-efficient
- Main supply mainly from fossil fuel
- RE is use as an alternative energy

Vision of 25/25:
- Energy Efficiency policy
- Maximum supply from RE
- Fossil fuel use for balancing of the RE
- Unutilize fossil fuel will be transfer and used by the next generation
Geothermal development: barriers to entry & its opportunities

Barriers to entry:

- Availability of good quality data
- Delay of project development,
- Bureaucracy,
- Lack of Power Plant Maintenance,
- The liability of the transmission line and infrastructure
- Pricing policy and the absence of pro-forma PPA on the geothermal bid package
- The limitation of the affordability of energy off taker (PLN)
- Uncertain tendering process
- Human capital on geothermal industry
- Supporting regulations and GOI guarantee to obtain project financing commitment
- Energy diversification is inconsistency

and, **the opportunities**....,
Opportunities

- Robust electricity demand growth
- Government policies evolving (after ‘98 crisis) to once again enable private development
- Indonesia energy policy - Renewable prioritized, 10 thousands MW electricity accelerating project (Government Regulation No. 5 Year 2006, and GR No. 4/2010)
- Indonesia has the largest inventory of undeveloped Geothermal resources in the world (40%)
- Government fund is limited
- Private Power Producers seems the future answer
- Geothermal price can be competitive and affordable and now agreed to put as FIT at 9.7 cents/kWH
Indonesia presents an unique opportunity for Geothermal growth but there are also many challenges to be overcome

- Fourth most populous country
- Indonesia is transforming effectively to a democratic country.
- The country is going through economic and structural reform
- There is potential in all areas of the market for Geothermal products and services
- Although the macro economy is improving there are negative perceptions towards Indonesia which need to be overcome
Geothermal development: its opportunities to reduce climate change
INAGA identifies the barriers to the growth of Indonesia geothermal industry:

- Competitiveness of Geothermal Energy Price;
- Continuing Subsidy of Fossil Fuel Price;
- Political Will to Intensify Geothermal Energy Utilization;
- Shortage of Competence Human Resources;
- Absence of Technology and Research & Development Supports;
- Lack of renewable incentives;
- Lack of Risk Appreciation and Mitigation Efforts;
- Absence of Integrated Energy Planning;
- Lack of Information and Publicity on Indonesia’ Geothermal Potency and Benefits; and
- Low Environmental Awareness.
Conclusion
The geothermal resources is about 27 GW to be the largest potential in the world.

The long experience of geothermal development has taken Indonesia to succeed increase its portion in energy mix.

The installed capacity is now about 1196 MW.

Geothermal energy as the clean and environmentally energy will help reducing global warming.

National Energy Policy push to increase the portion of renewable energy in energy mix up to 17% give the opportunity to the geothermal to increase its use in the near future.

10,000 MW power plant accelerating project create a lot of opportunities and reduce of un-certainties on geothermal development in Indonesia.
Conclusion

Today, lenders are in workout mode, and Indonesia needs to committed to continue promote develop geothermal as a tempting opportunity (decent returns and low risk).

In the last five years, there are a big increase in geothermal installed capacities as well as a significance use of brine for direct use of geothermal.

However, the GOI need a clear support for private power to minimize uncertainty in the project development.

In addition, GOI should educate (and sell) developers and lenders on the guaranteeing the viability of the project and provide a convincing story about investments in Indonesia.

Indonesia with high geothermal potential has a significant challenge to attract private power.
Conclusion

**INAGA as government’s partner for implementing the 9,500MW Road Map, proactively positions geothermal energy at competitive edge because of its renewable, environmentally sound, and of Indonesia’s energy market through the technology, business, and regulatory strategies.**
THE JAVA TIGER NEED HEAT FOR THEIR BODY IN THE RAINY SEASON
THANK YOU