JICA’s Cooperation in Geothermal Development

Session V

Regional Workshop on Geothermal Financing and Risk Mitigation in Africa

1 February 2018

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1. Strengthen the public sector to take resource development risks

Source: ESMAP 2012
Capacity Development in Kenya


Training of over 90 trainees in geoscience, reservoir engineering, and drilling technology in Menengai and Japan
<table>
<thead>
<tr>
<th>Role</th>
<th>Duration</th>
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<tbody>
<tr>
<td>Geothermal Executive</td>
<td>1 week course for executive officers</td>
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<tr>
<td>Core human resources (administrative officer, researcher)</td>
<td>Long-term training (master or doctor)</td>
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<tr>
<td>Geothermal resource engineer</td>
<td>6 months course</td>
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<tr>
<td>Drilling manager</td>
<td>6 week course</td>
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2. Provide Upfront Investment

Geothermal project needs large upfront investment.

During long development period, NO cash inflow.

There is strong relation between capital cost (ROE) and generation cost (ct/kWh).

Private company is unlikely to start geothermal project.

Cash flow of geothermal project

Development period (about 7 years)

Operation period (30 years)

Upfront investment is a big burden for private companies
JICA’s Financing instruments

Grant base
(ex: Masterplans, TA projects, F/S)

Yen Loan
(ex: Engineering service loans, project loans, private sector loans)

Others:
- VGF (Viability Gap Funding) loan
- EBF (Equity Back Finance) loan
- Contingent Credit Enhancement Facility for PPP Infrastructure Development (CCEF-PPP)
- Preparatory Survey for PPP Infrastructure Projects
Examples of JICA’s projects
Development policy and plan

- Assistance to formulate geothermal master plan to rank prospective sites based on geothermal resource potential, development cost and environmental impact
Ethiopia Tendaho Test Drilling Project

- Geothermal Master Plan Survey (2013-15)
- Surface survey (2015-17)
- Test drill project in Tendaho (2017-2020)

Photo: Tendaho exploration site
Djibouti Hanle Test Drilling Project

- Surface survey (2014-17)
- Test drill project in Hanle (2017-2020)

Photo: Hanle exploration site
Kenya, Olkaria I Unit 4&5

Loans: Total of 350MW in constructed or commited (L/A signed amount: 75.5 bil Yen)

- Olkaria I Unit 4, 5 (140MW. Completed 2015)
- Olkaria I Unit 6 (70MW. Planned completion 2021)
- Olkaria V Unit 1, 2 (140MW. Planned completion 2020)
- Olkaria I Unit 1, 2, 3 Rehab (planned)
Ethiopia: Alto Langano Geothermal Development

- Test drilling of 2 wells (GOJ, 2015-16)
- Drilling 22 production and reinjection wells (WB, 2014-2020)
- Wellhead Plant (JICA grant, 5MW, 2017-2019)
- 35MW Plant construction (JICA, 2019-22)
3. Create enabling environment (policy advice)

- **Kenya**: PPP Advisor for the Energy Sector (2017-2019)
  - Advise Ministry of Energy and Petroleum (MoEP) and energy related agencies (ERC, KPLC, KETRACO, KENGEN, GDC, and REA) to promote IPP/PPP

- **Ethiopia**: Advisor for Geothermal Development (2016-2018)
  - Advise Ministry of Water, Irrigation, and Electricity (MoWIE) and energy related agencies (EEP, EEA, GSE) on promotion of geothermal