STRATEGIES FOR DEVELOPMENT OF GEOTHERMAL IN AFRICA BY IPP’s

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OUTLINE

• Background
• IPP project
  • Project phases
  • Project Financing
  • Project requirements
• Suggestions
  • Suggested strategies
Background

• AFRICA’S ECONOMY HAS SEEN RAPID GROWTH IN THE LAST DECACADE

• OPPORTUNITIES FOR GEOTHERMAL IN AFRICA
  • ABUNDANT HIGH-TEMPERATURE RESOURCES IN THE EA REGION
  • CLEAN, BASE LOAD,
IPP Definition

An Independent Power Producer (IPP) or non-utility generator (NUG) is a private entity, which owns facilities to generate electric power for sale to utilities and end users.

Requires a Purchase Agreement (PPA) and an Implementation Agreement (IA) to be negotiated & signed, laying out the rights and responsibilities of all parties (e.g. transmission, infrastructure, tax incentives, bureaucratic delays, land rights, environmental issues, social programs, etc)
Typical Development Phases for a geothermal IPP project

**Timeline (Year)**

1. Concession Rights Acquisition
   - Fact finding, site visit, initial exploration, concession rights bidding
2. Resource Assessment
   - Surface Exploration, initial resource modeling, environmental baseline study, EMP/ESIA
3. Framework Contracts
   - Establish Head of Terms, Project Agreement, Power Purchasing Agreement, Tax Concessions
4. Exploration Drilling
   - Drill 3-5 exploration wells
5. Early Generation (Optional)
   - Installation of one or two well head units for early generation
6. Financial Closing / Tendering
   - Secure financing. Design power plant.
7. Production Drilling / Plant Construction
   - Drill multiple production wells, construct power plant.
8. Commissioning Operation
   - Steady state operation of power plant

**Description**

- **1** Concession Rights Acquisition
- **2** Resource Assessment
- **3** Framework Contracts
- **4** Exploration Drilling
- **5** Early Generation (Optional)
- **6** Financial Closing / Tendering
- **7** Production Drilling / Plant Construction
- **8** Commissioning Operation

**Outcome**

- **1** Decision to invest in surface exploration
- **2** Potential production-grade resource identified
- **3** Sign HoT of PA and PPA and others as appropriate
- **4** Proven resource with bankable, flowing wells. Conceptual reservoir model and generating potential
- **5** Sale of electricity to the local grid, data gathering for reservoir model development
- **6** Financial closing, selection of contractors & manufacturers
- **7** Flowing production wells, power plant commissioning
- **8** Cash flow, operating history leading to potential expansion
Exploration drilling is a risky, capital intensive activity that needs to be 100% equity financed to prove the resource and bring the project to the point of bankability.

Concession rights acquisition, resource assessment (geoscientific work) and contract negotiations are 100% equity financed.

**Financing of Geothermal Power Development** (Exploration Phase)

- **Preliminary Work**
  - USD 4-5 Mn

- **Exploration Drilling**
  - USD 20-25 Mn

**Point of Bankability**

- Debt: 0%
- Equity: 100%
Financing of Geothermal Power Development (100 MW Plant)

- **From Previous Slide**
- **Point of Bankability**

First USD 20-25 Mn is 100% risk equity

- Once the resource is proven, the project is bankable, unlocking large scale debt and project equity financing

<table>
<thead>
<tr>
<th>Cumulative Capital Outlay</th>
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<tbody>
<tr>
<td>Preliminary Work</td>
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<tr>
<td>Exploration Drilling</td>
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<tr>
<td>Production Drilling / Plant Construction</td>
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<tr>
<td>Operation</td>
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</table>

- **Debt:** 75%
- **Equity:** 25%

~USD 250 Mn

~USD 80-100 Mn
Questions and concerns of private investor in geothermal power:

- Is there good resource potential?

- Is the government and key stakeholders supportive of the project, and look at the private sector investor as a partner, and not a rival?

- Is there a secure financial and technical off-taker willing to sign a **Power Purchase Agreement** at a reasonable price?

- Can a favourable project agreement be negotiated, clearly laying out the rights and responsibilities of all parties (e.g. transmission, infrastructure, tax incentives, bureaucratic delays, land rights, environmental issues, social programs, etc)?

- Has anyone done this before/ is there country risk?
One way investors look at potential investment in geothermal energy is by weighing resource quality against the perceived risk of doing business in the country.

**Perceived Country Risk vs. Resource Potential**

*Country Risk Vs. Resource Potential*
(Conceptual Illustration of Geothermal Market Characteristics)

- Many of the world’s best resources are located in developing and emerging markets, providing for large reservoirs, significant economies of scale and low geological risk.
- The flip side is that due to perceived country risk, private financing tends to be more difficult to come by, as well as being more expensive.
- The first IPP project in a new location is perceived as the most risky. If initial IPPs are successful, more will flock behind them.

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<tr>
<th>Perceived 'Ease of Doing Business'</th>
<th>Estimated Resource Potential</th>
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<td>E.g. Germany, Australia, secondary resources in the United States</td>
<td>Iceland, Italy, Japan, New Zealand, Western United States</td>
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<tr>
<td>E.g. Ethiopia, Indonesia, PNG, etc</td>
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Suggested Strategy for IPP Development

- Ensure that initial IPPs are successful, so that more can follow suit
- Minimize risks through incentives (tax, tariff, other incentives)
- Support by Government and key stakeholders of the project
- Law and regulation that secure sustainable environment for long-term investment and operation
- Power Purchase Agreement which is mutually favourable
- Project agreement is Bankable (guaranteed cash flow, acceptable returns, securitize concession rights)
- Make it a win-win deal
THANK YOU