Analysis of Risk Mitigation Strategies for Geothermal Development

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Analysis of Risk Mitigation Strategies

- Government as Developer
- Cost-Shared Drilling
- Resource Risk Insurance
- Early Stage Fiscal Incentives
Government Acting as Developer:

Introduction

- **Key features of the approach**
  - Government explores and develops the resource
  - Private participation is limited

- **Where it has been applied**
  - Costa Rica – The Philippines
  - El Salvador – New Zealand
  - Guatemala – Iceland
  - Nicaragua – Turkey
  - Mexico – Ethiopia
  - Indonesia – Kenya
Government Acting as Developer: Pros & Cons

**Pros**

- Mobilizes large-scale financing from public sources
- Backstops resource risks through the strength of government treasury

**Cons**

- Some governments may not be able to afford the large scale investment
- Some countries may not have necessary in-country skills or capacity
- Mobilizing financing may be cumbersome due to bureaucracy
- The need to involve multiple government agencies may create conflicts
Government Acting as Developer:

MW Installed

- Costa Rica: 208 MW (3 fields)
- El Salvador: 205 MW (4 fields)
- Guatemala: 53 MW (2 fields)
- Nicaragua: 70 MW (1 fields)
- Mexico: 980 MW (4 fields)
- Indonesia: 467 MW (6 fields)
- Philippines: 1854 MW (7 fields)
- New Zealand: 220 MW (2 fields)
- Iceland: 664 MW (6 fields)
- Turkey: 15 MW (1 field)
- Ethiopia: 8 MW (1 field)
- Kenya: 180 MW (1 field)
Government Acting as Developer:
Impact of Scheme

- Worked very well were committed and capable to support the geothermal development (e.g., Costa Rica, New Zealand, Iceland, The Philippines)

- Moderately successful with significant geothermal resources but less consistent development strategies (e.g., El Salvador, Indonesia, Kenya)

- Not so successful in smaller countries that may have more pressing needs for limited government funds (e.g., Ethiopia, Djibouti, Bolivia)
Cost-Shared Drilling: Introduction

- **Key features of the approach**
  - Government shares some portion of drilling costs and risks with a private developer; or fully undertakes exploration drilling and testing of first few wells

- **Where it has been applied**
  - Japan
  - United States
  - Australia
  - Eastern Africa
Cost-Shared Drilling: Pros & Cons

**Pros**
- Catalyzes private investment in geothermal development
- Increases availability of risk capital for exploration drilling
- Reduces overall exposure of financial risk to developer
- Requires less public funding than full government development
- Backstops some resource risks through the government

**Cons**
- Some projects will not be viable for full scale development despite public funding
- Requires up-front public funding that may not be recoverable
Cost-Shared Drilling: MW Installed

- Japan: 535 MW (15 fields)
- United States: 137 MW (8 fields)
- Australia 1 MW (1 field, many wells drilled)
- East Africa (RFP recently issued, 11 EOI s, 5 projects invited to sign grant agreement)

**Impact on pace**

- Served as a significant catalyst for all current geothermal power generation in Japan
- Encourage drilling in United States
- Catalyzed drilling but no major MW impact due to technology choice in Australia
- East Africa impact TBD

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A Schlumberger Company
Cost-Shared Drilling: Impact of Scheme

- Management of this scheme is simple
- It provides a significant catalyst for private-sector geothermal development
- Costs to the government are significantly less than for “Government as Developer”
- Government’s cost-share portion could be recovered from the developer for successful projects, thus enabling some recovery and re-investment of funds
Resource Risk Insurance: Introduction

- **Key features of the approach**
  - Insurance to hedge against the risk of lower than expected well productivity

- **Where it has been applied**
  - France
  - Germany
  - Efforts are underway to implement this kind of insurance in Turkey, Kenya and the U.S.
Resource Risk Insurance: Pros & Cons

**Pros**

- Risk of drilling failure for developers is reduced
- Could mobilize equity capital due to reduced exposure to potential losses
- Reduced burden on government; insurance is provided by specialized entities

**Cons**

- High insurance premiums
- Increases required overall upfront investment (due to premium)
- Challenging to commercially underwrite substantial uncertainty (losses) in a relatively small global market
- Complex to design, implement and monitor
- Limited number of insurers offering coverage
Resource Risk Insurance: MW Installed

- Germany, a few fields (for power or combined heat and power, overall generation capacity for the German projects is <20 MW)
- France (for heat)

**Impact on pace**

- Insurance may have helped accelerate the pace of geothermal power development in Germany (the high feed-in tariff has played a major role in geothermal development there)
Resource Risk Insurance: Impact of Scheme

- Limited availability and difficult to obtain at an acceptable price for exploration well drilling
- Although the risk to developers is reduced, overall up-front funding required for exploration is increased (due to premium)
- Developers who need it most may not qualify for coverage and/or their premium could be inaccessibly high
- Has a high level of operational and management requirements
Early Stage Fiscal Incentives: Introduction

- **Key features of the approach**
  - Exemption from taxes and import duties related to exploration

- **Where it has been applied**
  - United States
  - Mexico
  - Turkey
  - The Philippines
  - Indonesia
Early Stage Fiscal Incentives: Impact of Scheme

- Government reduces fiscal levies (taxed/duties) that lowers overall investment in exploration drilling
- Reduces requirement for risk capital to fund early stage of a project
- Simple to administer and monitor when utilizing existing fiscal architecture, but not specifically aimed at resource risk mitigation
- Impact can vary depending existing taxes and levies
CONCLUSIONS

Quantitative analysis indicates . . .

- From IPP Point-of-View:
  - early-stage fiscal support will reduce risk more compared with insurance

- From Government Point-of-View:
  - Better leverage of government funds in cost sharing scheme
  - Rapid scale-up could be from either public developer or cost-sharing
Analysis of Risk Mitigation Strategies:
Installed geothermal capacity vs. time in Japan

- 1974 - Government serving as geothermal resource developer.
- 1980 - Government cost-sharing program.
- 2002 - End of cost-sharing program.
Analysis of Risk Mitigation Strategies:
Installed geothermal capacity vs. time in Kenya

- early 1970s - Government serving as geothermal resource developer.
- 1989 - Change in requirements for World Bank loans.
- 2007 - IPP obtained financing for Olkaria III.
- 2012 - FIT policy.
Analysis of Risk Mitigation Strategies:
Installed geothermal capacity vs. time in The Philippines

- 1970s - Government serving as geothermal resource developer.
- 1983 - Commissioning of power plants.
- 1992 - Philippine Department of Energy is created.
- 1995 - Government enters BOT program.
- 2001 - Energy sector is privatized.
Analysis of Risk Mitigation Strategies:
Installed geothermal capacity vs. time in the United States

- 1963 - Government implements risk reduction programs.
- 1964 - Government makes exploration data public in Circular 790 and Investment Tax Credits enacted along with Cost-shared drilling.
- 1975 - Government implements risk reduction programs.
- 1978 - Government makes exploration data public in Circular 790 and Investment Tax Credits enacted along with Cost-shared drilling.
- 1981-2013 - Government cost-shared drilling through GRDA.
- 1984 - Federal programs and PURPA end. - States adopt Renewable Portfolio Standards.
- 2000-2007 - Government cost-sharing through GRED.
- 2012 - Government cost-shared drilling through GRDA.
- 1981-2013 - Government cost-shared drilling through GRDA.