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
 - El Salvador
 - Guatemala
 - Nicaragua
 - Mexico
 - Indonesia

- The Philippines
- New Zealand
- Iceland
- Turkey
- Ethiopia
- 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 1MW (1 field, many wells drilled)
- East Africa (RFP recently issued, 11 EOIs, 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







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







Analysis of Risk Mitigation Strategies: Installed geothermal capacity vs. time in Kenya







Analysis of Risk Mitigation Strategies: Installed geothermal capacity vs. time in The Philippines







Analysis of Risk Mitigation Strategies: Installed geothermal capacity vs. time in the United States





