

# Global Survey and Comparative Analysis of Geothermal Risk Mitigation

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# Risk Mitigation Strategies



- Government as Developer
- Cost-Shared Drilling
- Resource Risk Insurance
- Early Stage Fiscal Incentives
- Other Strategies

# Government Acting as Developer

- **Capacity 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

- Worked well where government committed and capable of supporting 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

- Capacity Installed:
  - Japan: 535 MW (15 fields)
  - United States: 137 MW (8 fields)
  - Australia 1MW (1 field)
  - East Africa (RFP recently issued)
- Served as catalyst for all current geothermal power generation in Japan
- Less impact in the United States
- No impact in Australia
- East Africa impact not clear yet



# Resource Risk Insurance

- Capacity Installed:
  - Germany (<20 MW)
  - France (for heat only)
- Has helped accelerate geothermal development in Germany (as has the high feed-in tariff)



# Early Stage Fiscal Incentives

- Applied in the U.S., Mexico, Turkey, Philippines and Indonesia
- Government reduces taxes at the exploration stage
- Modestly reduces the investment capital needed at the early stage
- Simple to administer and monitor



# Other Strategies and Incentives

- **Renewable Portfolio Standards**
  - Mandated power targets for renewable generation
- **Feed-in Tariff**
  - Mandated power price for renewable generation
- **Loan Guarantees**
  - Facilitating financing of renewable power projects through Government backed loans
- **Tax Credits**
  - US Investment Tax Credit (ITC) for 10-30% of the capital investment costs (paid out at the completion of plant construction); reduces tax
  - US Production Tax Credit (PTC) paid throughout the operating lifetime of a geothermal project; increases revenue over time



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

