A Geothermal Element in Hawaii’s Energy Mix
A Brief Background on Geothermal

What are we talking about?
Generating electrical power...
Using heat stored in the earth...
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Why Hawaii?

All Hawaii’s islands are volcanoes

With the ultimate source of heat being the mantle – producing for >80 My

We don’t have the technology to tap that source but we can use heat stored inside the volcanoes

Only available in limited locations
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Background on Geothermal

Investigation of geothermal began in the early 1960’s – wildcat drilling

Intensive work began in 1970’s

Kilauea East Rift Zone was thought to have the highest potential

Discovery well – HGP-A drilled in 1976

HGP-A Power Plant → PGV Plant

Additional comm. drilling in Puna

State wide geothermal assessment completed in 1983
Geothermal Assessment Findings
Geothermal Assessment for Older Islands
Geothermal Assessment for Older Islands
Geothermal Assessment for Older Islands
What can Geothermal Contribute to the R.E.P.S.?

- Quantitatively uncertain
- Estimates made ranging from a few hundred MWe to >>1000 MWe
- All based on small amounts of obsolete data
- Minimum would be a few hundred MWe
- Mature technology
- Base load capacity (firm power)
What can Geothermal Contribute to GHG Reduction?

• Current re-injection technology emits a few grams/MWhr of elect.

• Displaced coal: ~1000 kg/MWhr
  – 100 MWe Geo = 100 tonnes/hr of CO$_2$ or ~876,000 tonnes/year

• Displaced oil: ~750 kg/MWhr
  – 100 MWe Geo = 75 tonnes/hr of CO$_2$ or ~657,000 tonnes/year
**What are Capital and Operating Costs?**

Approx. Capital Cost >30 MWe plant

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<td>Exploration</td>
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<tr>
<td>Steam Field</td>
<td>$375-$560</td>
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<td>Power Plant</td>
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<td>0.20-0.35 c/kWh</td>
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<td>O&amp;M Plant</td>
<td>0.35-0.55 c/kWh</td>
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Renewable Energy Policy Project
Pew Center
What major obstacles need to be overcome for implementation?

- **Mismatch of resource with market**
  - Primary resource area has smallest market
  - Primary market has lower potential

- **Technical and economic challenges in transporting supply to market**
  - Interisland cable
  - Developing a market for curtailed power
What major obstacles need to be overcome for implementation?

• **Attracting venture capital**
  – Low resource risk > high market risk
  – Low market risk > high resource risk

• **Community resistance to concentrated development impacts**
  – Substantial additional development in Puna
  – Other reasons not to focus in Puna
Is it feasible to transport power from Hawaii or Maui Islands to Oahu?

- Technical and economic issues
  - Deep channel between Hawaii and Maui
  - Financing the cable
  - Line losses
  - Community acceptance
Overcoming the impediments

Reduce the resource risk on the older islands
Increase the market on the younger islands
• To reduce resource risk:
  – Geophysical assessment using modern tools and capabilities
  – Limited exploratory drilling program to prove out the resource in areas where geophysics is promising

• Expand or Narrow options
Pau