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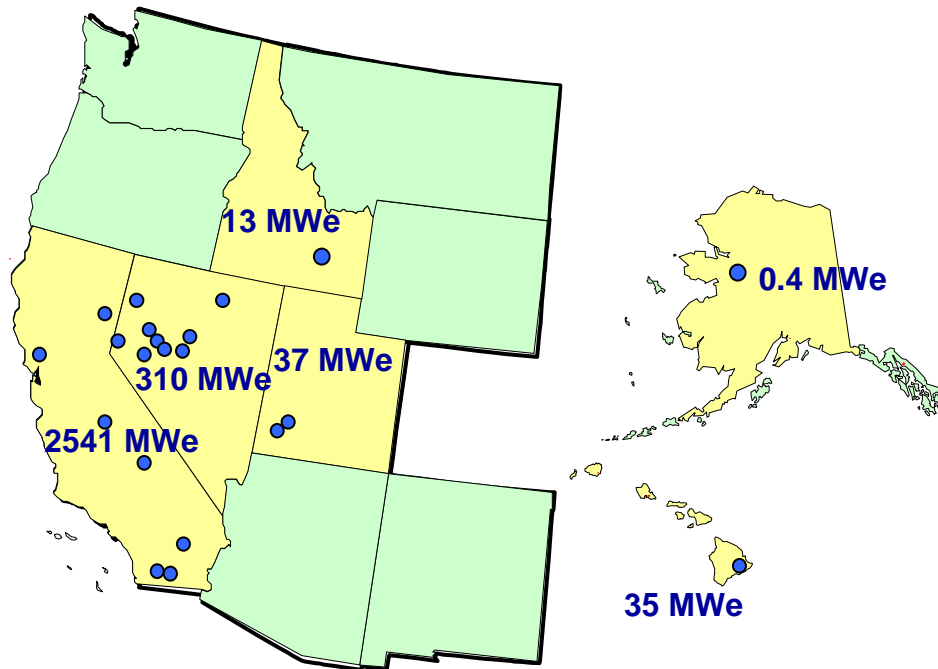
# The United States Dept of Energy Geothermal Technology Program: A Renaissance



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**2008 International Partnership for Geothermal  
Technology  
Initial Workshop and Signing Ceremony  
Keflavik, Iceland  
August 27, 2008**

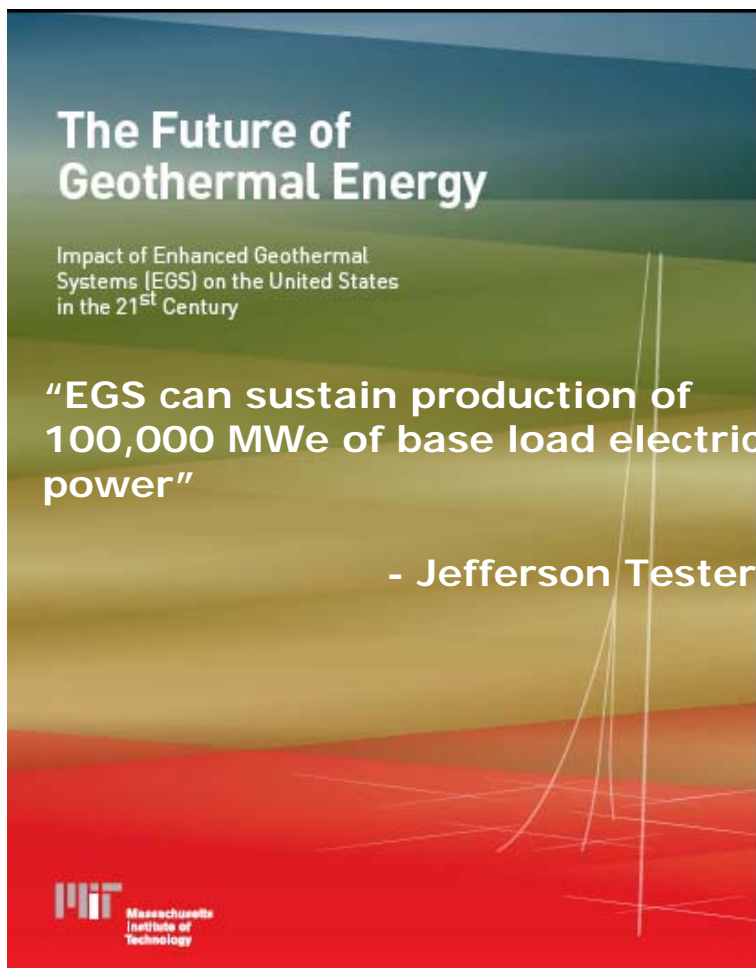
# U.S. Geothermal Energy Overview



● Geothermal Plant

## U.S. Market

- Installed capacity of 2,900 MW (GEA)
- Total of 86 new projects in 12 states (GEA)
- Additional 3,300 MW will be developed by 2012 (GEA)
- Oil and gas co-production potential of 5,000 MW in 7 states (Texas Gulf Coast Plain alone)
- Tax credits: \$0.02/kWh production tax credit or 10% investment tax credit

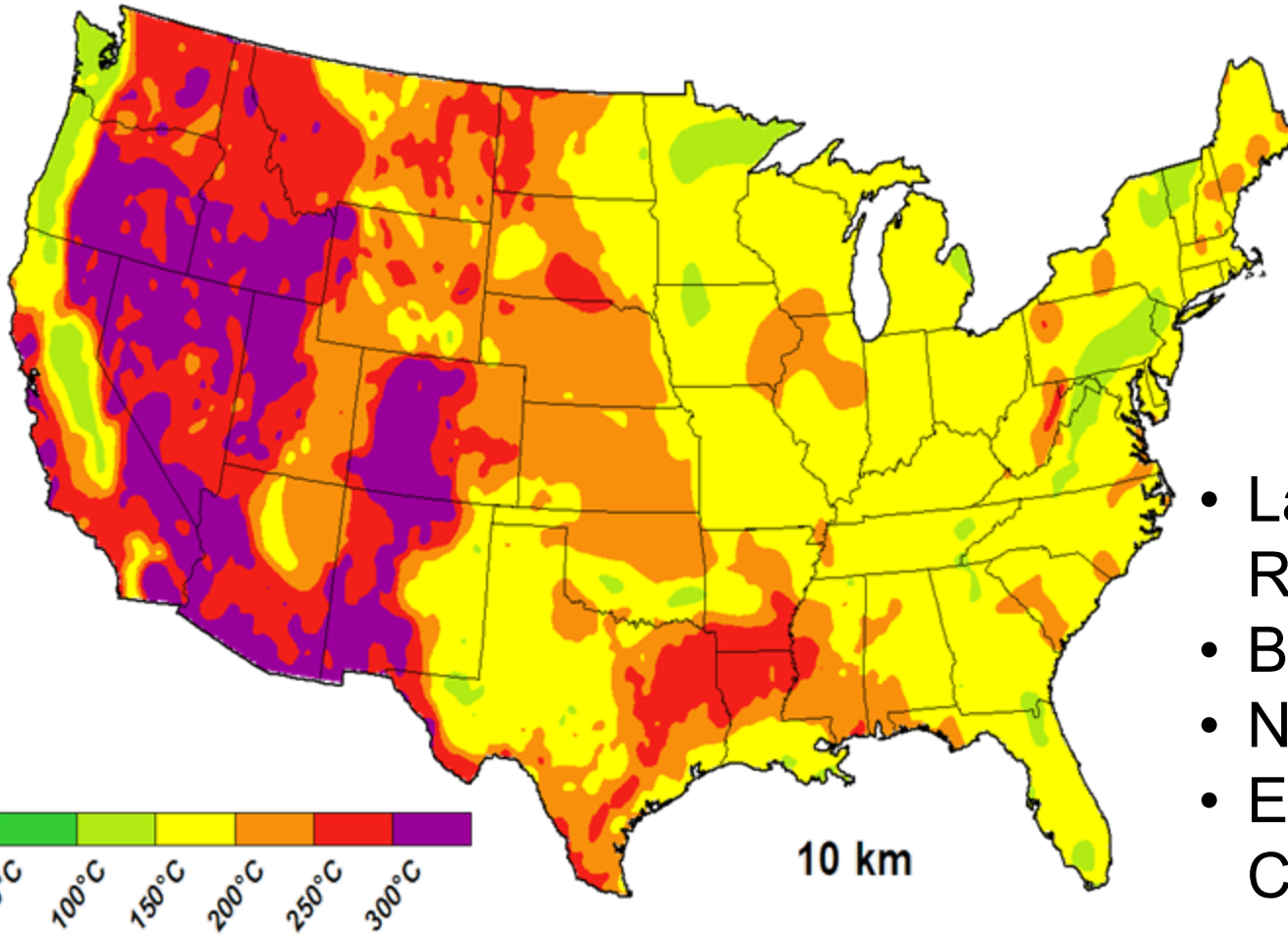


## 100 GW of Geothermal Capacity Means:

- 500 power plants (200 MW/plant)
- 100,000 wells (>3km depth)
- 300 rigs (100 wells/rig)
- 10,000 drilling related jobs
- 30,000 construction related jobs
- 6,000 plant related jobs
- \$1.4B in royalties (50% federal land)

These projections were based on historical knowledge and reflect cumulative impacts.

# U.S. Geothermal Resource



- Large Renewable Resource
- Baseload Power
- National Scope
- Environmentally Compatible

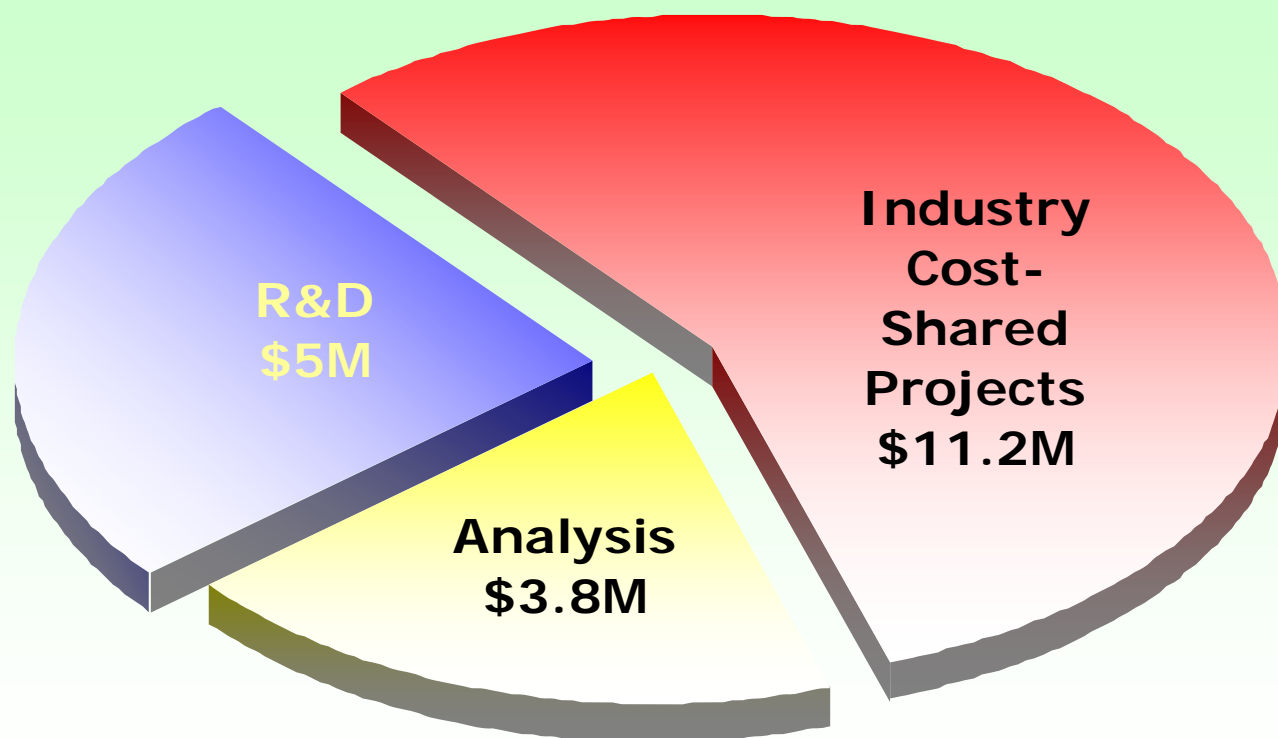


- R&D – Emphasis on EGS while supporting hydrothermal
- Cost-shared Field Projects – EGS using marginal hydrothermal and oil & gas fields
- Institutional Barrier Removal – All geothermal energy resources
- Loan Guarantees – Advanced geothermal technologies
- Sustainable Drilling Fund – Reduce exploration risk for new resources (under consideration)

# Budget Allocation across Partners



## *FY 2008 Geothermal Program Spending Distribution*



Total \$20M

\$30 Million expected for 2009 Appropriations



- **R&D and Demonstration Projects**

- Topic 1 – Component Technologies R&D:

- Downhole pumps; Fracture characterization; Image fluid flow; High-temperature logging tools and sensors; Stimulation prediction models; Tracers and tracer interpretation; Zonal isolation

- **Total DOE Funding – \$40M; 20% industry cost share**

- **Performance – up to 3 years**

- Topic 2 – System Demonstrations-

- Stimulating and Engineering reservoirs

- **Total DOE Funding – \$50M; 20-50% industry cost share**

- **Performance – 3 to 6 years**

- **Status – Closed on August 12, 2008**

- **Projects to be announced September, 2008**



## **Creating a multipurpose national database of existing and historical geothermal data**

- Utilize well temperature and geologic data for selection and assessment of sites with geothermal development potential
- Include historical data to reduce the learning curve for EGS development
- Include geothermal resource, power plant and institutional data to enable tracking of technology progress

To be announced later this year.

# Geothermal Educational Program



- **Develop Geothermal Curriculum**
  - Competitively fund institutions of higher education to develop geothermal educational curricula and degree programs
- **Initiate Educational Scholarship Program**
  - Send students to foreign countries with geothermal development and curriculum for education, research and/or internship
- **Initiate University Student Competition**
  - Students will solve real life problems and implement solutions in the field
- **Vocational Training**
  - Develop next generation of skilled workers for widespread EGS facility construction and operation
- **K-12 Educational Modules**
  - Provide early exposure to geothermal energy and technology

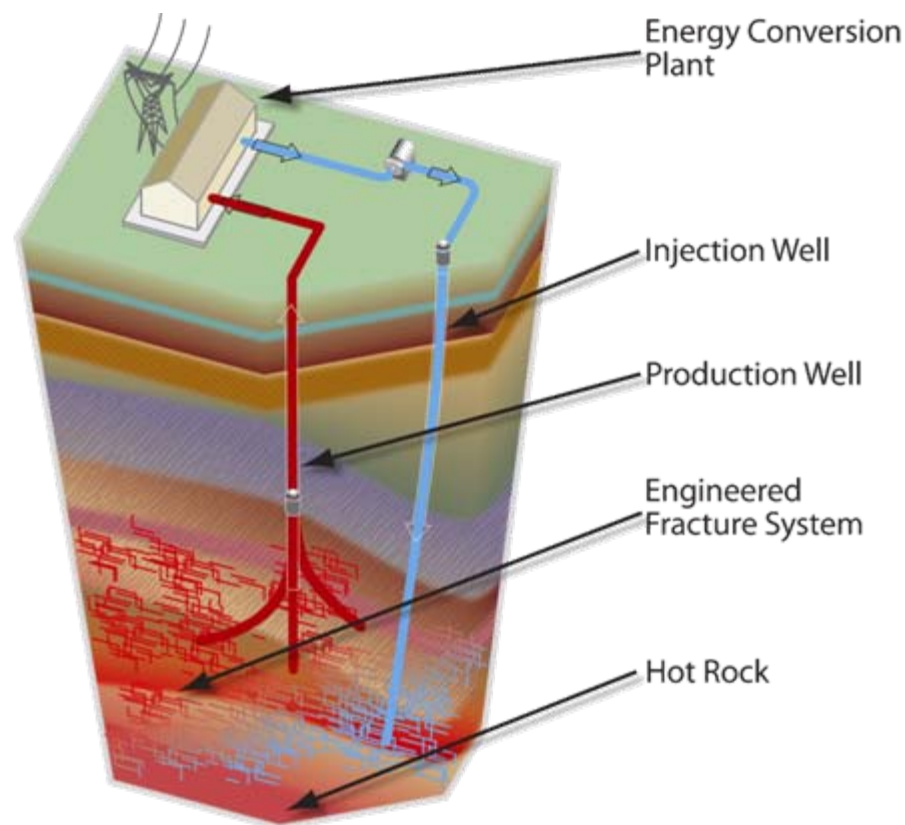
To be announced later.

# EGS Critical Performance Elements



The program focuses on technology development & demonstration.

- Stimulation and maintenance of a large volume of rock (several km<sup>3</sup>) to minimize temperature decline in the reservoir.
- A sustained reservoir fluid temperature ( $\geq 200^{\circ}\text{C}$ ) and flow rate (80 kg/sec) (equivalent to about 5 MWe) for six years are needed for economic viability. No EGS project to date has sustained flow rates  $>25$  kg/sec.
- Replication of EGS reservoir creation. EGS technology has not yet been proven to work at commercial scales over a range of geological settings.



# The Time is Right for Geothermal!



- **Energy Security**
  - Prices rising
  - Climate concerns
- **Financing**
  - Banks
  - Venture Capitalists
- **Industry**
  - Geothermal Developers
  - Oil & Natural Gas Companies
  - Utilities
- **Government**
  - Federal (taxes, loan guarantees, leasing, EISA 2007)
  - State (renewable portfolio standards)
- **International**
  - IPGT



# U.S. Goals for IPGT



- U.S. is in early stages of EGS RD&D
- Exchange of information on best practices and lessons learned
- Accelerate RD&D
- Identify and avoid blind alleys
- Maximize our efforts, limit duplication