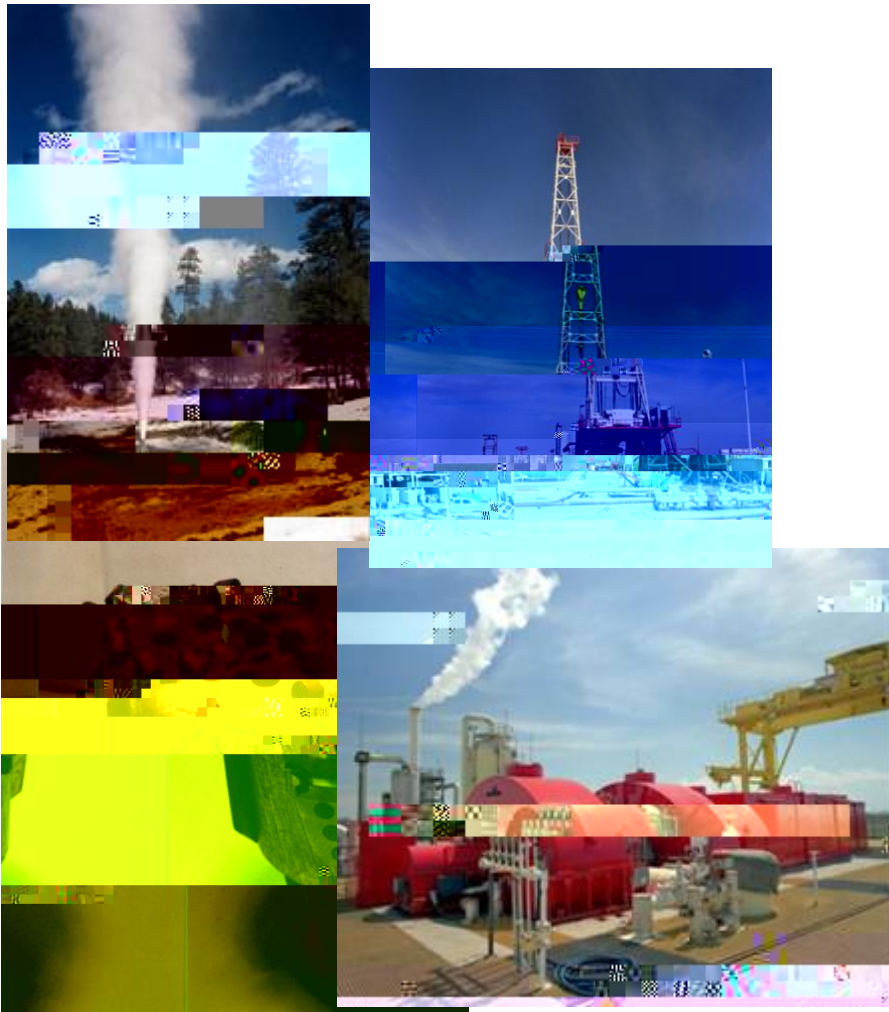




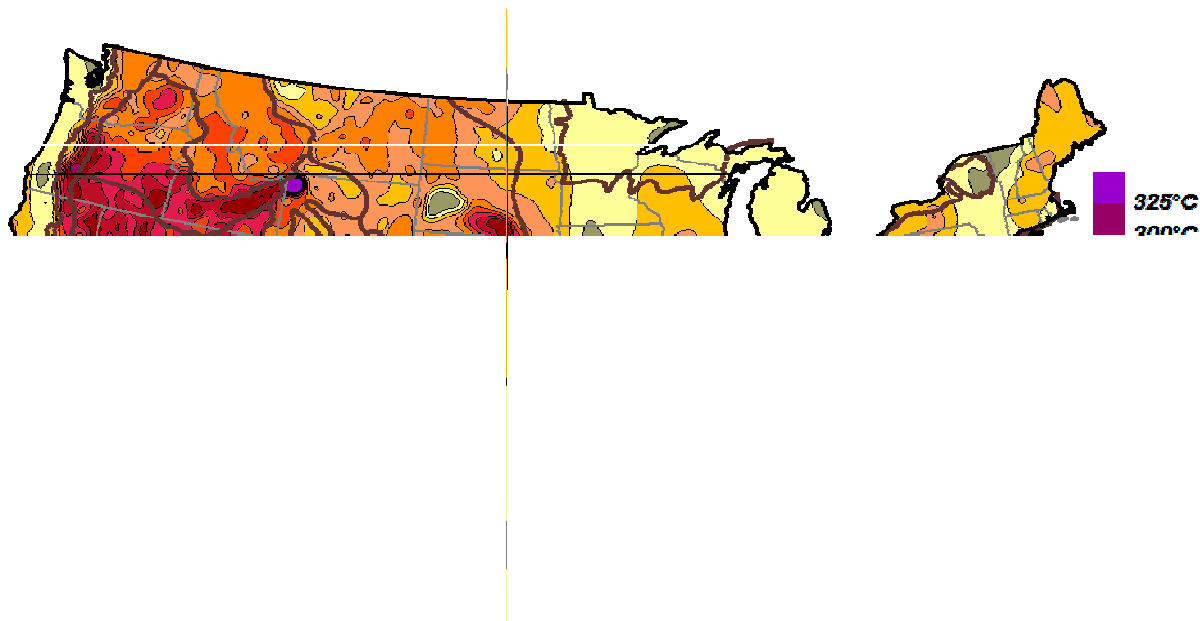
# Department of Energy Geothermal Focus

Raymond LaSala  
Technology Development Manager  
Geothermal Technologies Program

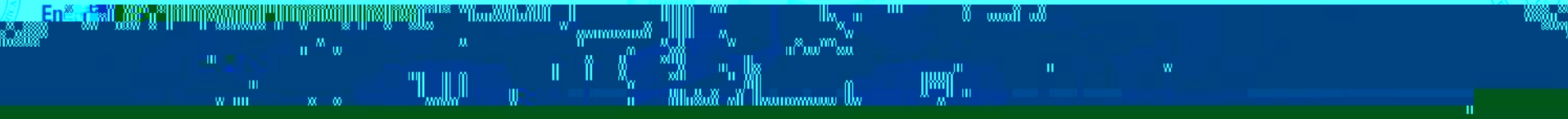
SMU Geothermal Conference  
March 13, 2006



# Program Vision







# Key Strategic Directions

- Enhanced Geothermal Systems
- Exploration and Resource Characterization
- Drilling and Wellfield Construction
- Reservoir Management
- Energy Conversion
- Institutional Barriers

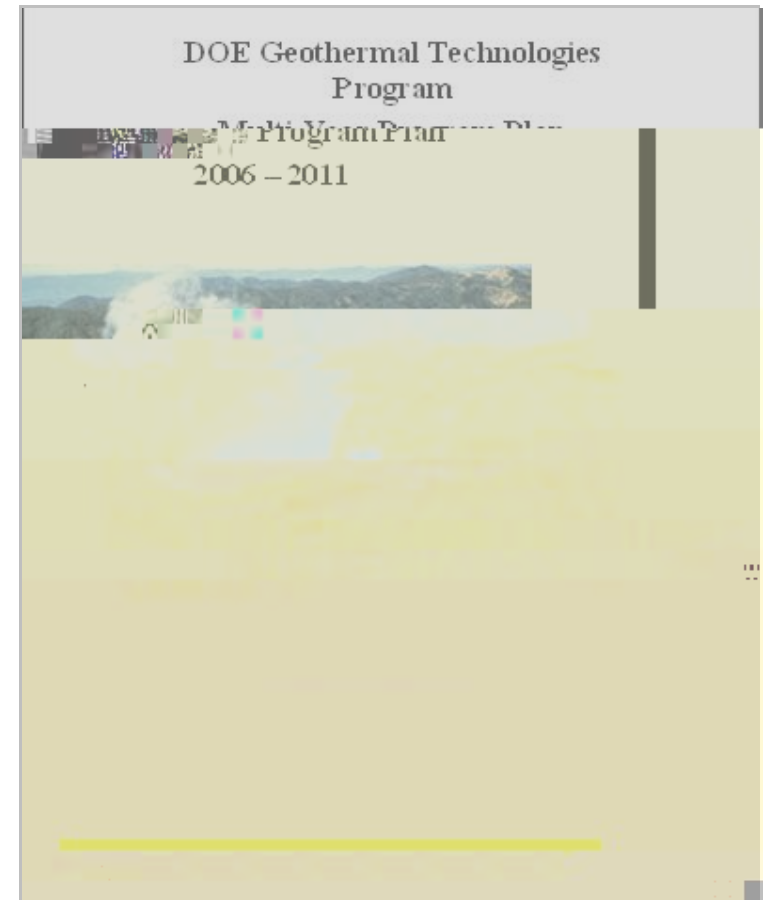
# Strategic Plan

- Addresses:
  - Power markets
  - Geothermal industry
  - Understanding of resources
  - Projected technical and economic requirements
  -



# Multi-Year Program Plan

- Identifies near-term technical challenges and opportunities (through 2011)
- Covers expected program activities
- Describes near-term program priorities





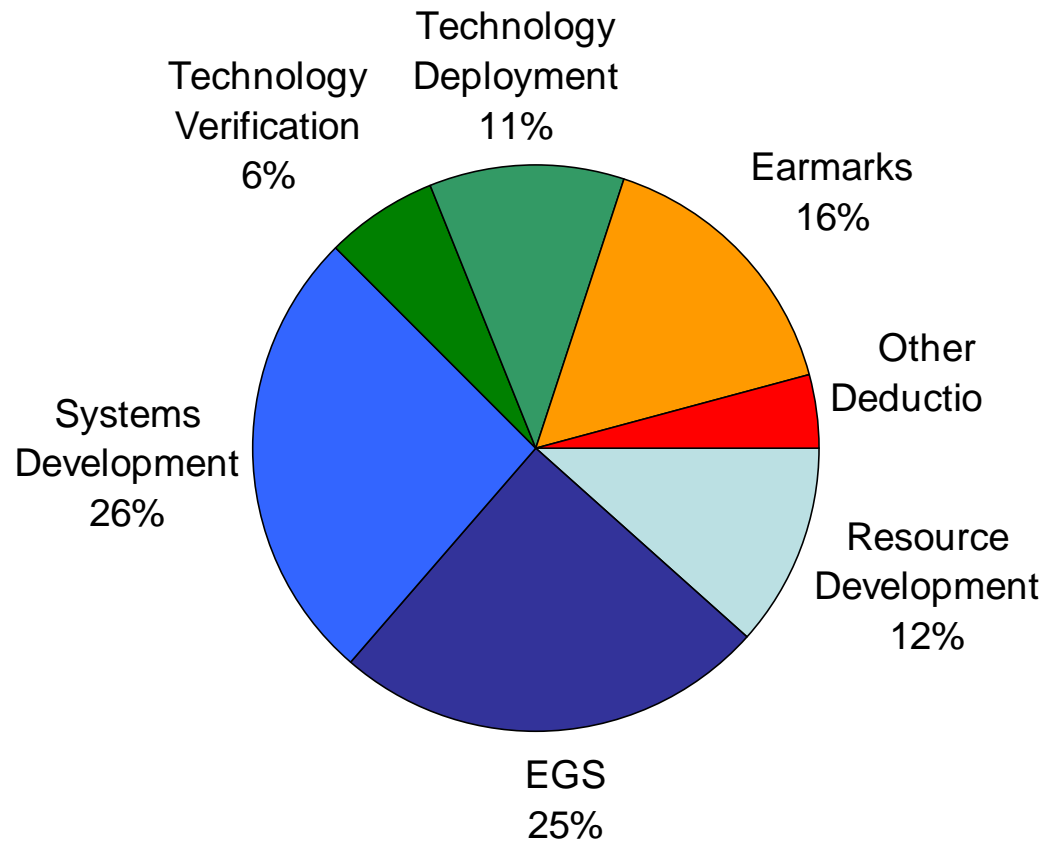
# Program Funding

Subprogram	FY05 Comparable Appropriation	FY06 Appropriation	FY07 Request
Technology Development	15,480	15,317	0
Enhanced Geothermal Systems	6,687	6,110	0
Systems Development	6,292	6,379	0
Resource Development	2,501	2,828	0
Technology Application	6,232	4,232	0
Technology Verification	3,130	1,547	0
Technology Deployment	3,102	2,685	0
Congressionally Directed Activities	3,558	3,750	0
<b>Total</b>	<b>25,270</b>	<b>23,299</b>	<b>0</b>



# Budget Allocation

## FY06 Budget





# Enhanced Geothermal Systems

Create hydrothermal reservoirs at sites lacking C

- Conduct research on improved and innovative technologies for creating and managing EGS.
- Apply technological tools in partnership with industry at selected field locations.



# Exploration

## Double the exploration success rate from 20% to 40%

- Improve most effective exploration techniques
- Update assessments of known resources
- Support exploration for new resources

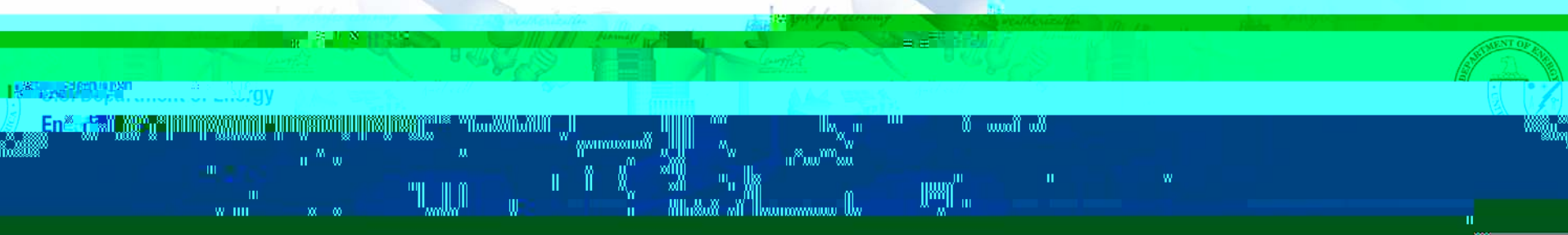
### Accomplishments:

- Verified Steamboat Springs, NV resource for 42 MW plant
- Verified resources at Rye Patch, NV for 12 MW plant
- Proved aeromagnetic surveys can help find hidden faults

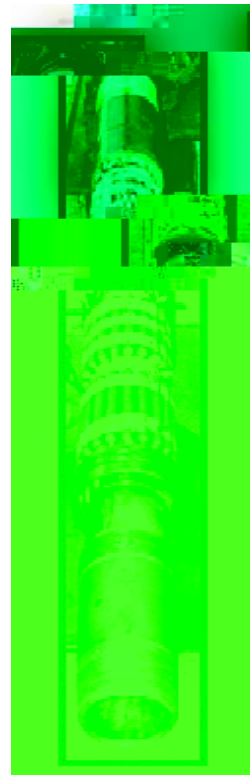
### Present Status:

- Completing evaluation of InSAR for remote sensing
- Completing eight exploration projects





## Accomplishments to Date





# Energy Conversion

## **Reduce the capital cost of surface systems by 20 percent**

- Improve efficiency of heat rejection systems for lower-temperature resources
- Develop more efficient cycles for lower-temperature resources
- Reduce O&M costs through optimized maintenance schedules, better construction materials, and hardier instruments.

## **Accomplishments to Date:**

- Technology for Salton Sea metastable expansion
- Innovative condensers
- High performance coating materials

## **Present Status:**

- Conducting field verifications of technology
- Evaluating enhanced air-side condenser fins



# Field Verification Projects

## **Chena Hot Springs, AK Power System Validation**

- 2x200 kWe PureCycle™ ORC modules using R134a
- Very low temperature (165° F) resource
- 37° F stream water for cooling
- Near-Arctic off-grid location

## **Salt Wells, NV Power System Validation**

- 10 MWe KCS-34 Kalina Cycle plant using ammonia-water
- Moderately low temperature (260° F) resource
- Evaporatively-enhanced air cooling
- Grid-connected central station power plant

## **Low-Cost Coating Material Field Tests**

- CurraLon™ PPS for HX tubes at Mammoth and Puna, wellheads at Salton Sea, and injection spools at The Geysers
- Organometallic phosphates for brine-wetted condenser fin-tube at Mammoth

# Air-Cooled Condenser Enhancement

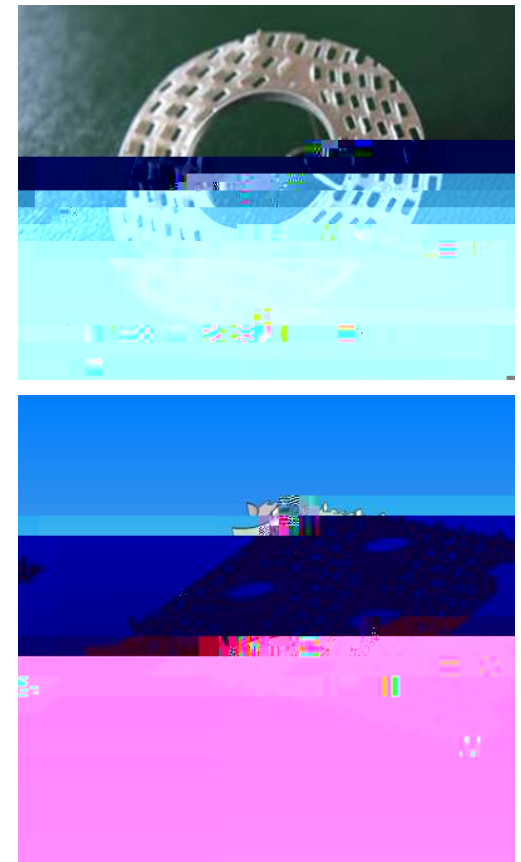
Tabs on fins interrupt boundary layers, extend out to coolest air, and reduce size of wakes downstream of tubes

## Tabbed Fin-Tube

- Easiest to apply to individual fins e.g., GEA steam condensers
- Working with McElroy to apply to tension-wound fins

## Tabbed Plate-Fin

- Oil coolers, trim coolers, evaporators, and condensers
- Licensing to Super Radiator Coil

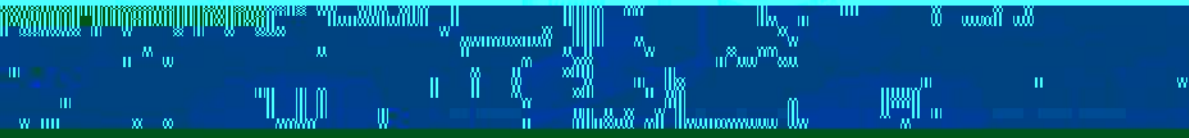






# Geothermal Electric Technology Evaluation Model

- Technical and cost modeling tool
  - Internally and externally validated
  - Analyzes economic impact of technology improvements
- Reference systems defined by properties of existing hydrothermal plants
- Modeling system undergoing active development
  - System-scale effects of improvements only partially modeled to date
  - Technology baseline assumptions under review



# Next Steps

- The groundwork has been laid
- More to come from lab staff and financial assistance recipients over the next two days
- We are available to discuss technology transfer or other collaboration

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