U.S. Department of Energy
Energy Efficiency and Renewable Energy

Department of Energy Geothermal Focus

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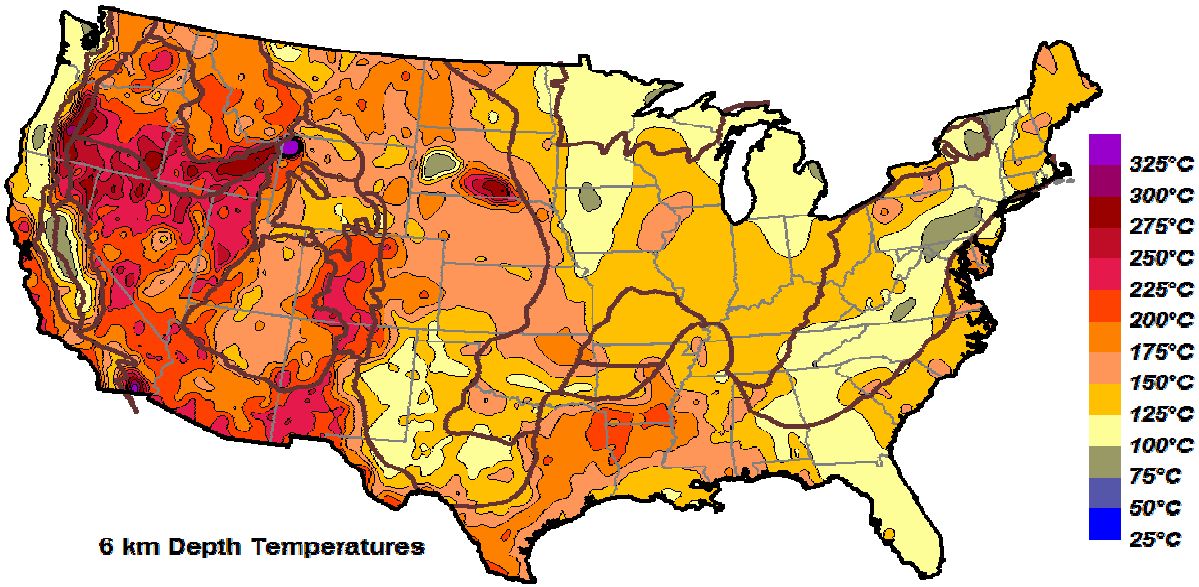
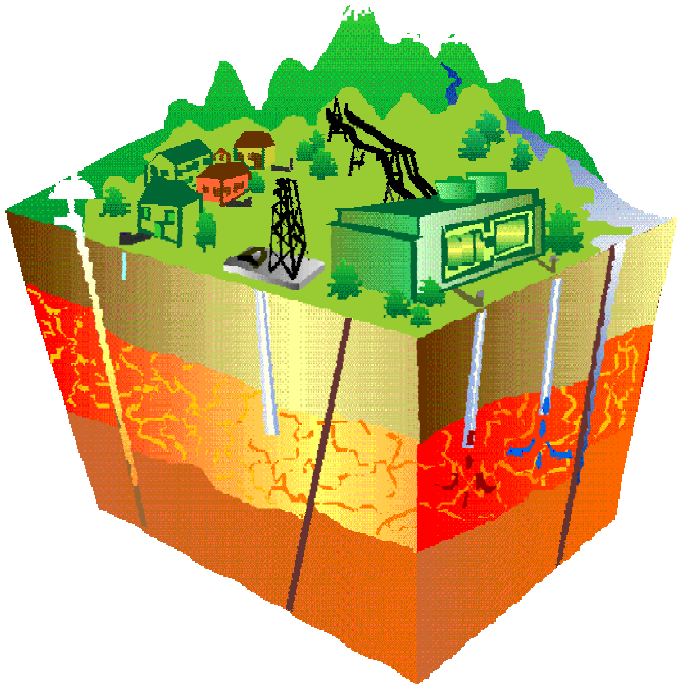
Program Vision

The DOE Geothermal Technologies Program has a vision of geothermal energy as the Nation's environmentally preferred baseload energy alternative.



Program Mission



The Program's mission is to work in partnership with U.S. industry to establish geothermal energy as an economically competitive contributor to the U.S. energy supply.

Strategic Program Goals

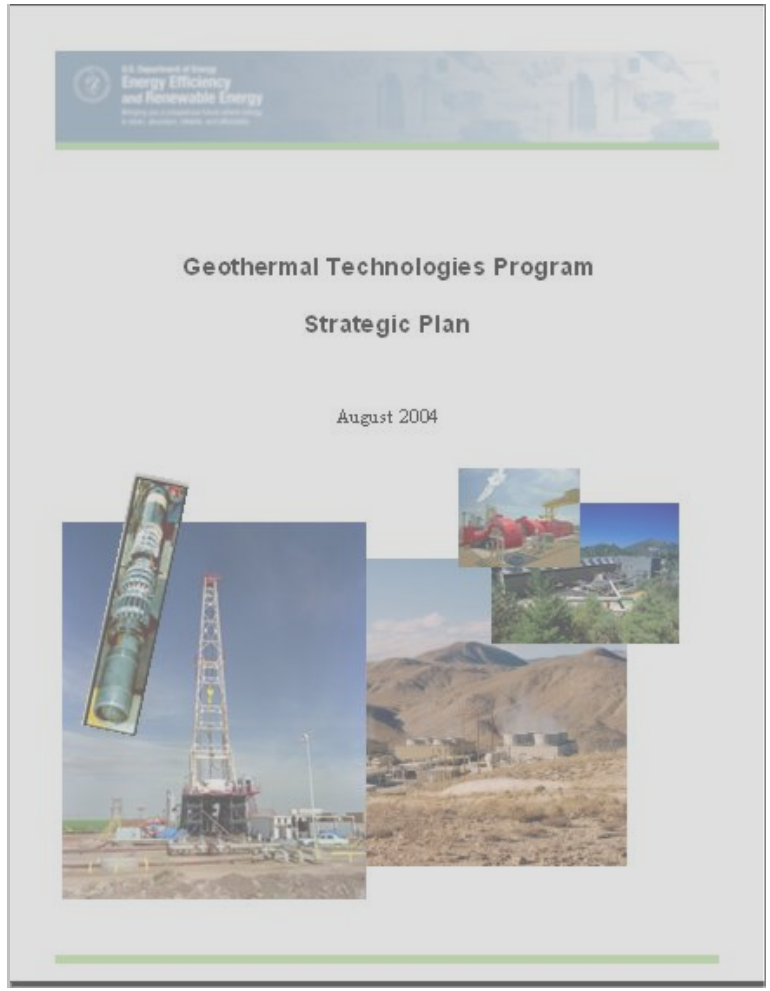
- Reduce the levelized cost of hydrothermal development to less than 5 cents/kWh by 2011
- Increase the economically viable geothermal resource to 40,000 megawatts by 2040
- Decrease the levelized cost of electricity from Enhanced Geothermal Systems to less than 5 cents per kWh by 2040

Key Strategic Directions

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

Strategic Plan

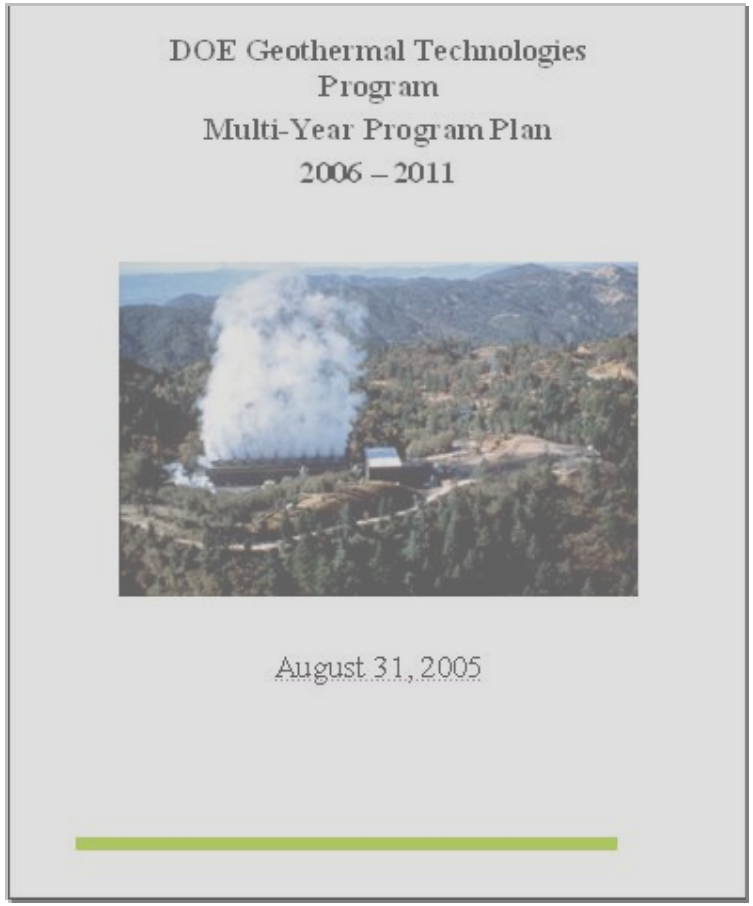
- Addresses:
  - Power markets
  - Geothermal industry
  - Understanding of resources
  - Projected technical and economic requirements
  - Policy recommendations
  - Technical opportunities



Available at: http://www.eere.energy.gov/geothermal/pdfs/36738.pdf

Multi-Year Program Plan

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



Available at: http://www.eere.energy.gov/geothermal/pdfs/consolidated_draft_83105_final.pdf

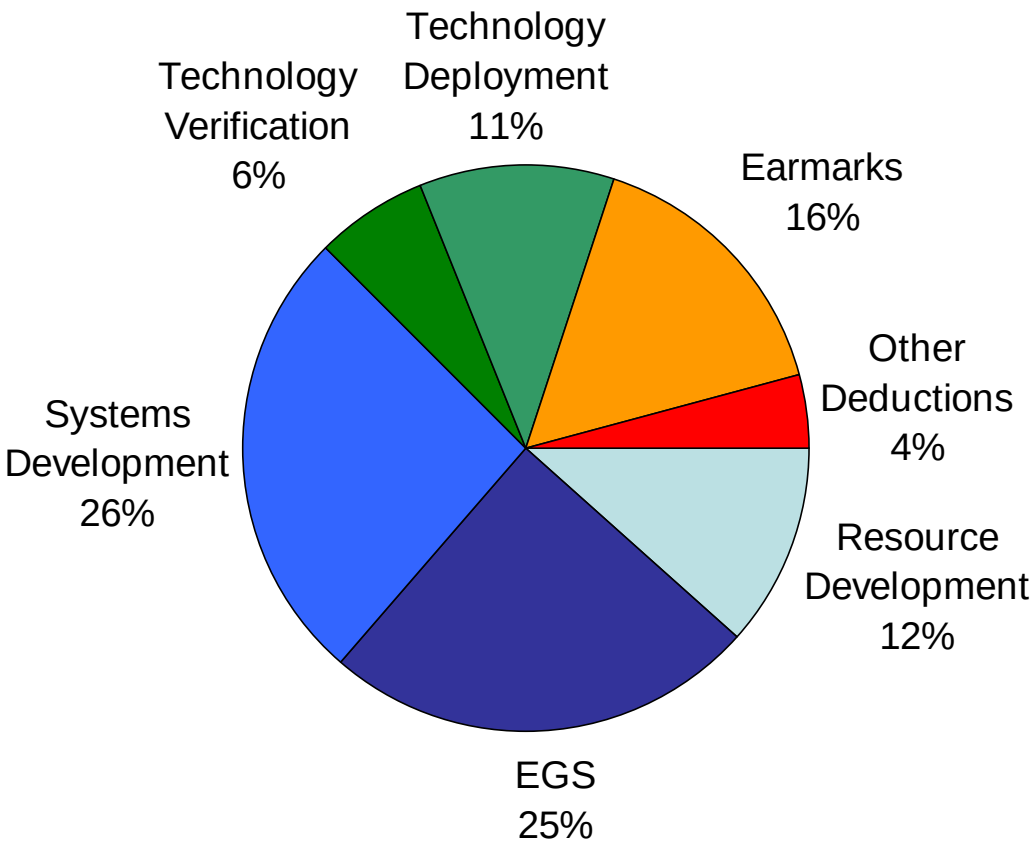
Program Funding

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
Total	**25,270**	**23,299**	**0**

*All figures in $thousands

Budget Allocation

FY06 Budget



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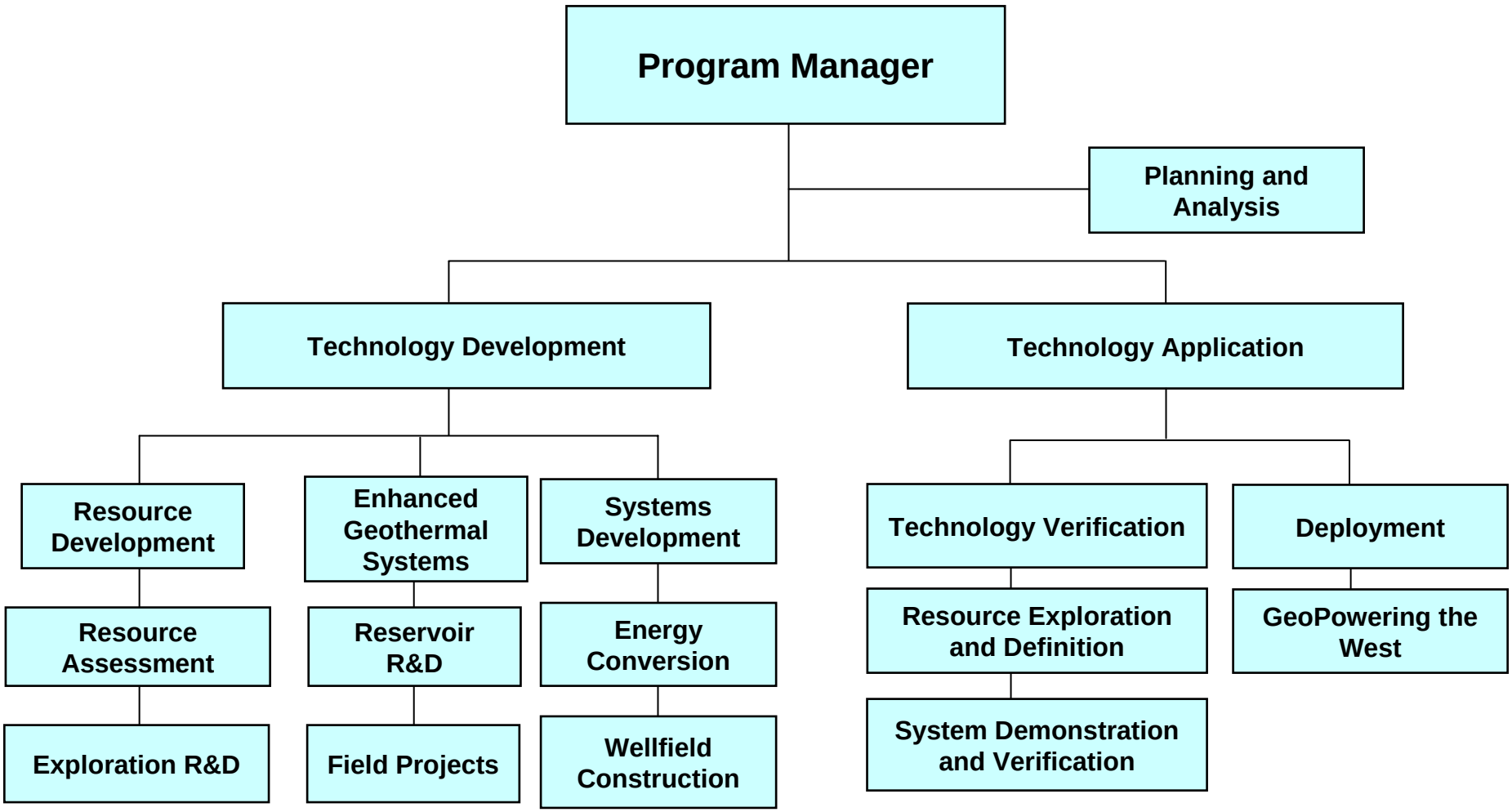
Geothermal Technologies Program
Organization Chart



Enhanced Geothermal Systems

Create hydrothermal reservoirs at sites lacking economic hydrothermal resources

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

Accomplishments to Date: Technical feasibility of EGS demonstrated at various sites

Present Status: Cost-shared projects underway at Desert Peak, NV and Coso Hot Springs, CA

Path Forward: Awards for research and development on fractures and fracture systems

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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

Wellfield Construction

Reduce Cost of Drilling 25% by 2008

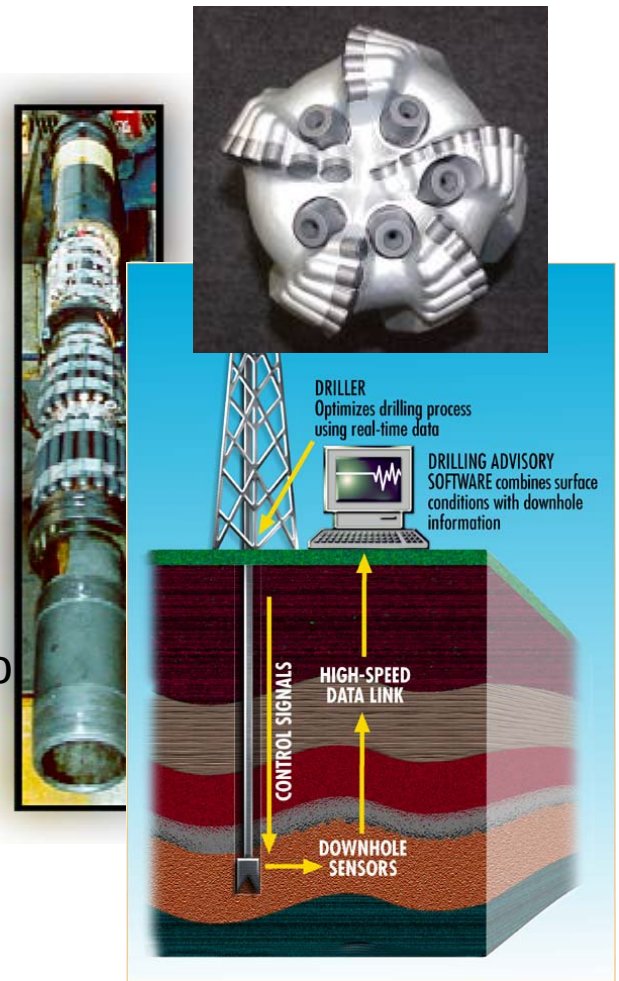
- Improve the component parts of a drilling system to perform essential functions quickly, reliably, and cheaply.
- Investigate long-term revolutionary advances in drilling materials and techniques with the target of drilling twice as deep for the same cost.

Accomplishments to Date:

- Diagnostics While Drilling (DWD) proof of concept
- Hard rock drill bits
- Polyurethane grout for lost circulation control
- High-temperature integrated circuits for logging too

Present Status:

- DWD system test with proprietary drill bits
- Drill bit database being developed



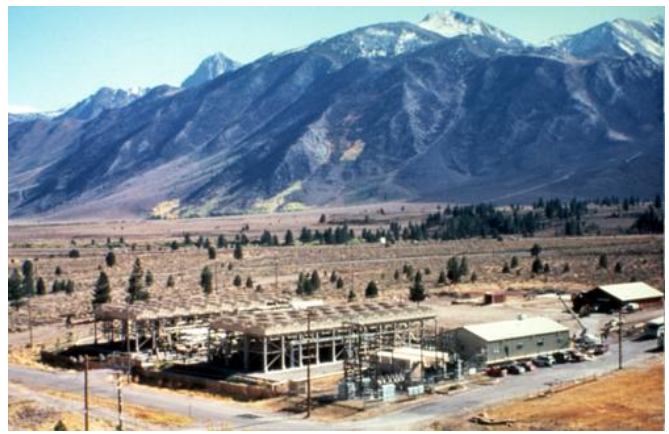
Energy Conversion

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^{o} F) resource
- 37^{o} 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^{o} 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

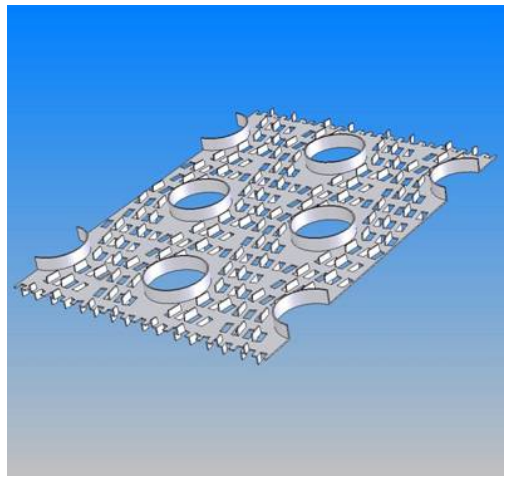
Tabs on fins interrupt boundary layers, extend out to coolest air, and reduce size of wakes downstream of tubes

Tabbed Fin-Tube

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

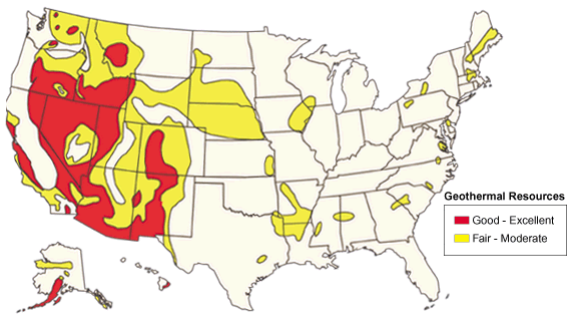
Tabbed Plate-Fin

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



GeoPowering the West

GeoPowering the West



- DOE Leadership
  - State Geothermal Workshops/Working Groups
  - National Geothermal Collaborative
- State and Local Outreach
  - State Energy Program
  - Resource Mapping/Publications
  - Native American Involvement
  - Technical Assistance
- Industry Partnerships
  - Broad-Based Awards for Outreach Activities
  - Support for Direct-Use Community

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

Geothermal Legacy

The Geothermal Legacy Project will provide rapid, searchable Internet access to thousands of geothermal documents previously available only in print format at a few archives

FY05 Accomplishment:

- Provided Internet access to 3,200 documents in searchable format

FY06 Goal:

- E-archive 4,100 additional reports in searchable format, establishing Web access to a total of 7,300 Geothermal Legacy reports

Documents are available at the DOE Office of Scientific and Technical Information (OSTI) Repository (http://www.osti.gov/energycitations)

- Permanent repository contains 15K+ citations for geothermal technical reports including journal articles, conference reports, and patent filings

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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