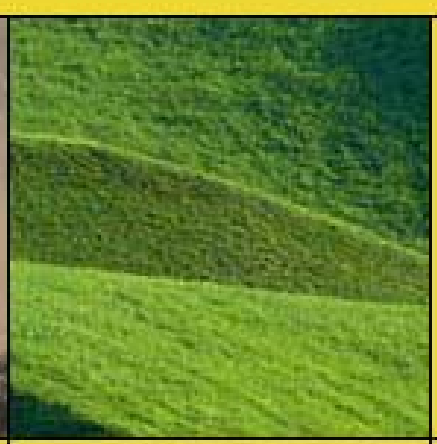
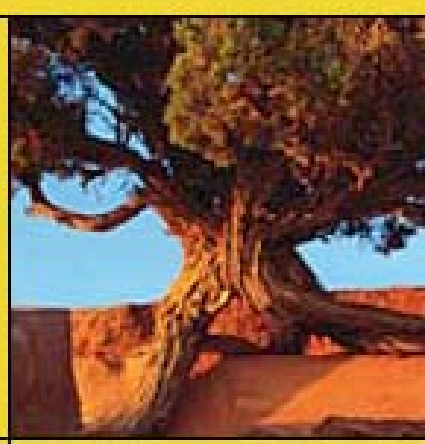
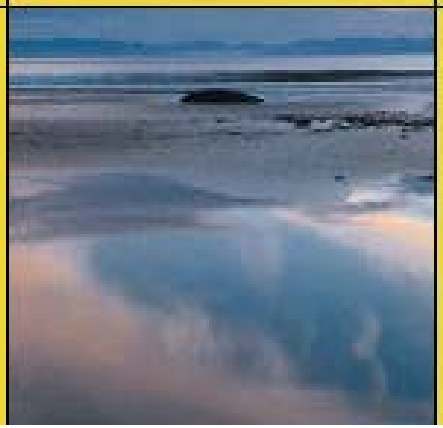
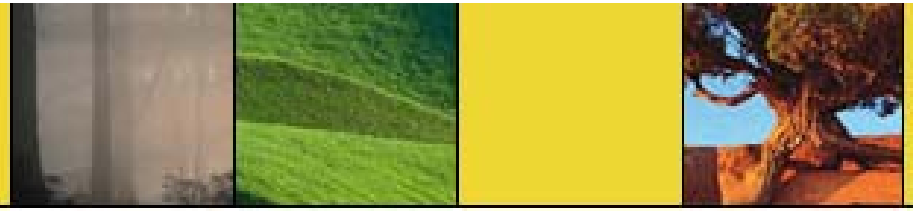
State activities supported by the Department of Energy's GeoPowering the West Program


Geothermal Energy: Will Federal Support be Sufficient to Harness its Vast Potential?

Liz Battocletti,
Bob Lawrence & Associates, Inc.
2 March 2006

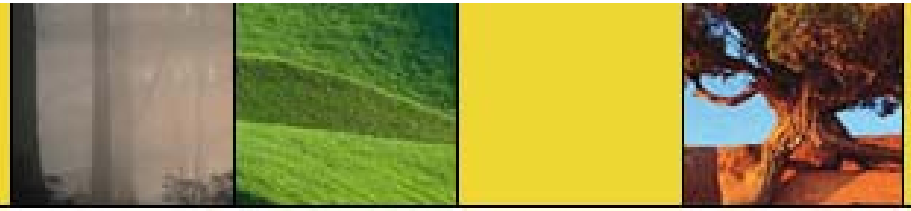




Introduction

- What is happening in the states?
  - *A lot.*

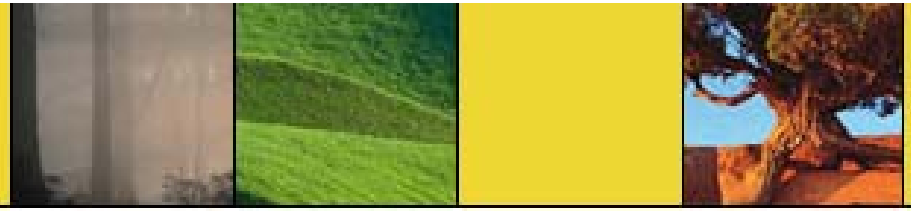
- Why?
  - *Because of the Department of Energy's GeoPowering the West (GPW).*



GeoPowering the West

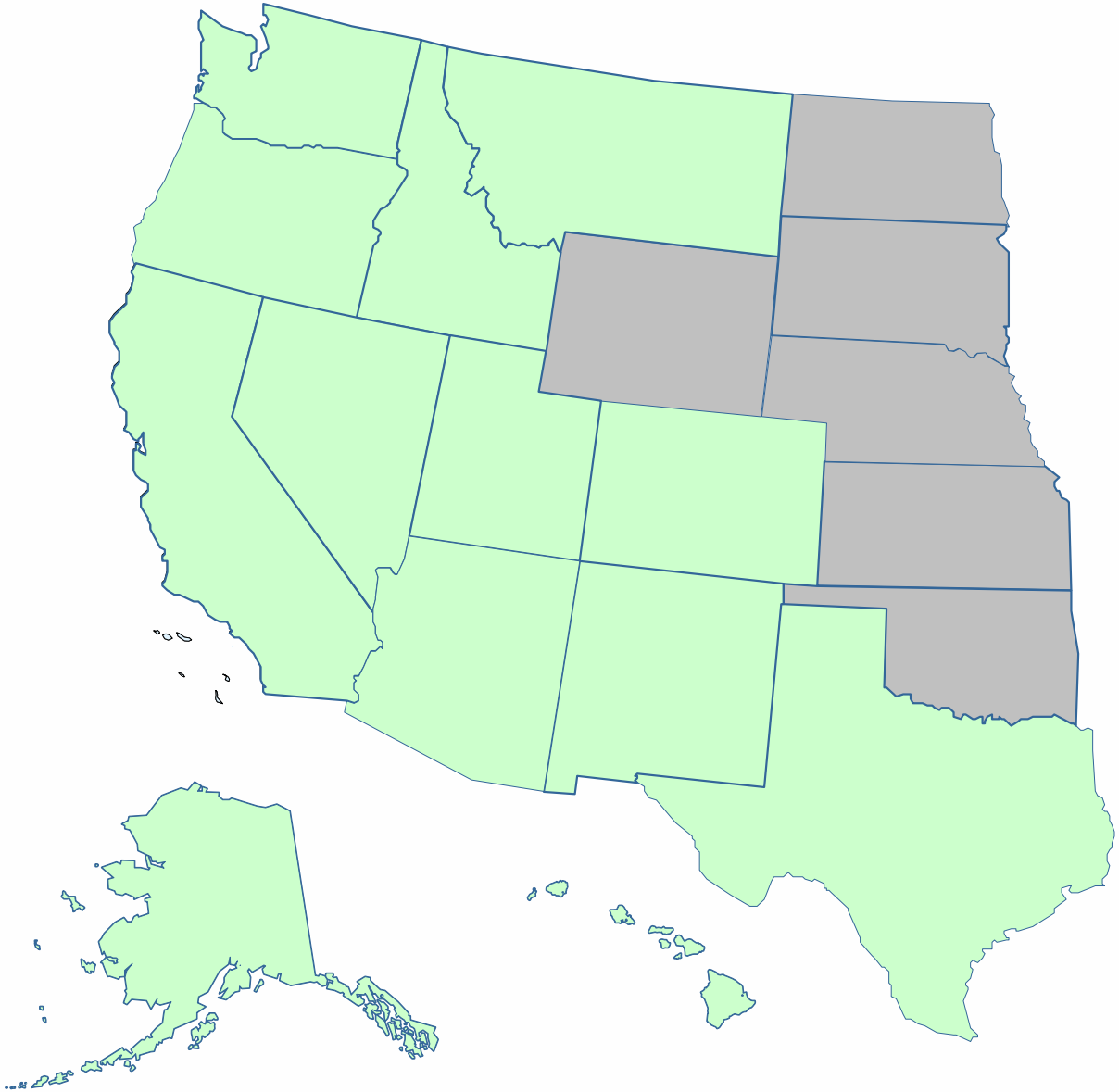
- Launched in 2001 to dramatically increase the use of geothermal energy in the western United States, Alaska, and Hawaii.
- Demonstrates the economic, environmental, and social benefits of geothermal energy for direct use and power generation.
- Identifies and addresses barriers to geothermal development, e.g., lack of knowledge, market, regulatory, etc.
- Helps states create regulatory and economic environments that are more favorable for geothermal and other renewable energy development.

GPW activities



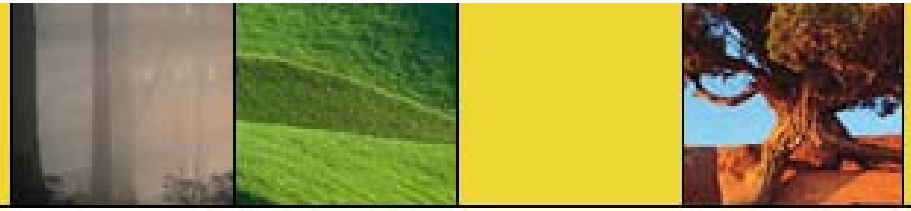
- Contact Database
  - Has grown from ~ 300 in October 2001 to 2,283 in February 2006.
  - An increase of 761%.
  - People request to be added weekly.
- GPW working groups & partners
- Task Order Agreements
  - Project-specific technical assistance.
  - 12 selected to date in 9 states.
- State activities

Working Groups



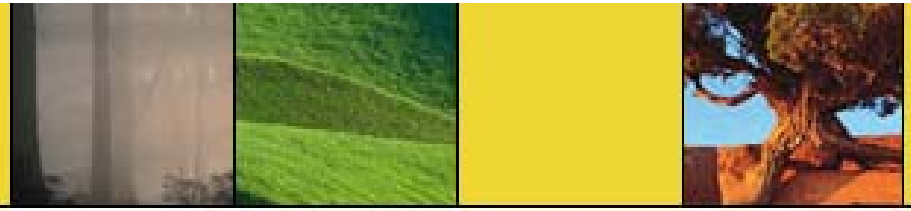
1. Alaska, est. in 2002
2. Arizona, est. in 2002
3. California, est. in 2003
4. Hawaii, est. in 2003
5. Idaho, est. in 2002
6. Montana, est. in 2006
7. Nevada, est. in 2000
8. New Mexico, est. in 2000
9. Oregon, est. in 2003
10. Texas, est. in 2005
11. Utah, est. in 2002
12. Washington, est. in 2002
13. Utility, est. in 2005
14. Other states???
15. Agriculture???

GPW Partners



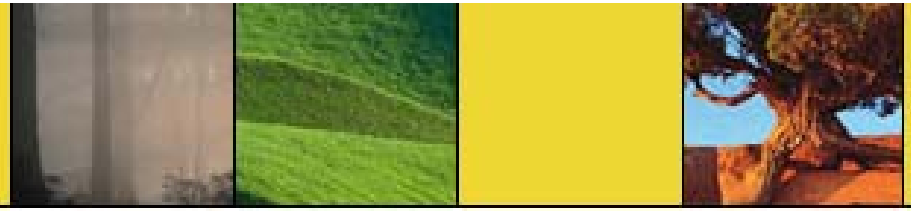
- Alaska Energy Authority
- Bob Lawrence & Associates, Inc.
- Bonneville Power Administration
- Bureau of Land Management
- California Energy Commission, Geothermal Program
- California Geothermal Energy Collaborative
- Colorado Governor's Office of Energy Management and Conservation
- Converse Area New Development Organization
- Delta-Montrose Electric Association
- Hawaii Department of Business, Economic Development & Tourism
- Geo-Heat Center, Oregon Institute of Technology
- Geothermal Education Office
- Geothermal Energy Association
- Geothermal Resources Council
- Governor's Office of Energy Management & Conservation
- Idaho Department of Water Resources
- Idaho National Laboratory
- Intermountain West Geothermal Consortium
- Millenium Energy LLC
- Montana Department of Environmental Quality
- National Conference of State Legislatures
- National Renewable Energy Laboratory (NREL)
- Nevada Division of Minerals
- Nevada State Office of Energy
- New Mexico Energy Department
- Oregon Department of Energy
- Sandia National Laboratories
- Southern Methodist University
- The Ormond Group
- U.S. Geological Survey
- University of Nevada, Reno
- USDA Forest Service
- Utah Geological Survey
- Utility Energy Forum
- Washington State University Energy Program
- Western Area Power Administration
- Wyoming Business Council

GPW Projects



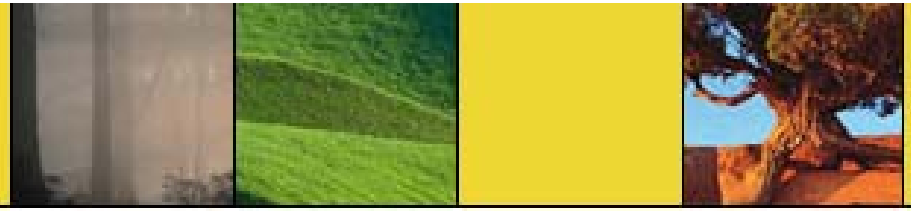
1. Geothermal Industrial Park – Elko, NV
2. Herald and News Building Heating and Cooling – Klamath Falls, OR
3. USDA Farm Bill Section 9006 - Energy Efficiency Improvements Template
4. Mammoth Lakes District Heat/Direct Use Project Review and Feasibility Assessment – Mammoth Lakes, CA
5. Myrtle Tree Geothermal Development Project – Canby, CA
6. Feasibility Studies and Life-Cycle Cost Analyses (3) – NE, ID, and ND
7. Mt. Grant General Hospital Heating System Replacement – Hawthorne, NV
8. Feasibility Study of Direct Use Enterprises in Kapoho – HI
9. Willcox Greenhouse – Willcox, AZ
10. Evaluation of New Mexico State University Geothermal District Heating System – Las Cruces, NM

AK



- Chena Hot Springs Resort
  - About 60 miles northeast of Fairbanks.
  - 2005 : Installed absorption chiller to keep its Aurora Ice Museum and Hotel from melting. Uses 163°F spring water to provide 15 tons of -20°F chilling.
  - 2006: Installing two 200-kW geothermal power plants.
    - Geothermal power will displace diesel power plant that uses $250,000 worth of fuel a year.
    - Ribbon cutting – July 2006.
    - Will be first geothermal power generation in Alaska.
    - Resort already uses geothermal for heat, its pools, and greenhouses.
- Unalaska
  - 800 miles southwest of Anchorage.
  - Looking at geothermal to replace high-priced diesel fuel for electrical generation.
  - The town (population 4,400) and its energy-intensive seafood processing industry use up to 16 MW of electricity.
  - Diesel currently costs $2 million a year.
  - If City Council approves plant, it would need to be built before the federal PTC expires.

AZ

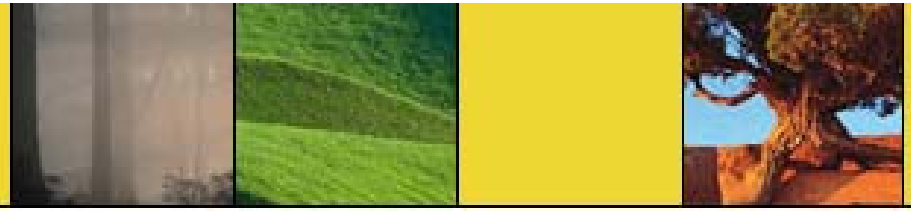


- Arizona is in the process of revising its renewable portfolio standard.
  - State regulatory commission is proposing to include direct use applications as well as electricity production from geothermal.
  - This change will encourage regulated utilities to develop direct use projects to meet renewable energy generation requirements.
  - If approved, would make Arizona the first state to institutionalize, in a portfolio standard, the benefits of direct use in offsetting natural gas and propane use.

- As a result of last year's State Energy Program (SEP) grant for geothermal energy, Arizona has more than doubled the members of the Arizona Geothermal Working Group and resulted in the evaluation of several new projects.

- 18 May 2006: Arizona Geothermal Working Group will host the first-ever statewide conference on direct use geothermal energy development in Tempe.

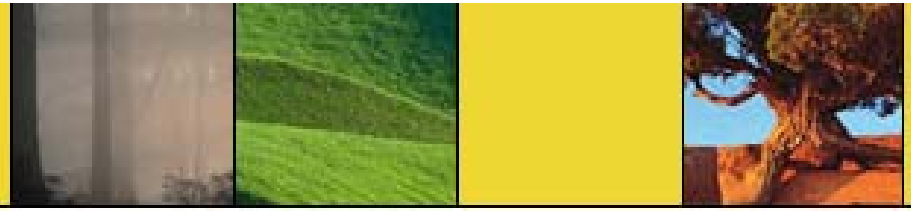
CA



- 23 May 2006: The California Geothermal Energy Collaborative (CGEC) will convene the 2006 California Geothermal Summit at the University of California-Davis Alumni Center.

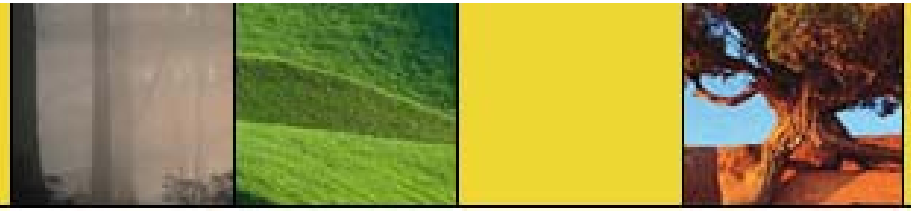
- 24 May 2006: CGEC will hold a half-day workshop on "California's RPS Program-A Geothermal Viewpoint."

CA – cont'd



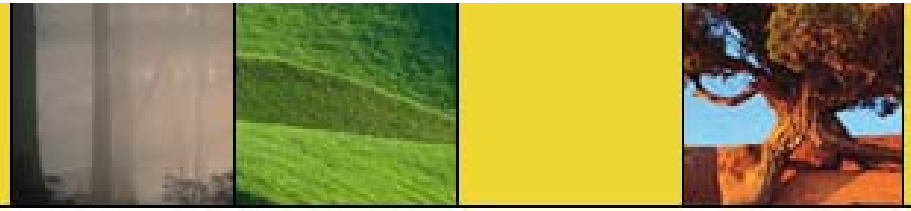
- Study done for the California Energy Commission funded by GPW:
  - Measured economic, environmental, and social benefits of six geothermal heating and three power generation projects.
  - Six geothermal heating projects:
    - From 1981-2005, offset the emissions of 1 million gallons of propane and 10 million gallons of fuel oil.
    - Net emissions offset of 148,243 tons of Carbon Dioxide and 4 tons of Nitrous Oxide.
    - Equal to 29,353 passenger cars not driven for one year; 15 million gallons of gasoline; or the electricity used by 17,408 households for one year.
    - Saved a total of $11.1 million, an average of $463,287 per year.

CA – cont'd



- Two power generation projects would have the following economic benefits:
  - $366 million in direct, indirect, and induced payroll over the plants' 30-year lifetimes;
  - Federal, state, and local income, payroll, and property taxes totaling $353 million over 30 years;
  - $146 million in royalties paid over 30 years—$22 million to California, $11 million to Siskiyou County, $11 million to the Federal Government, $40 million to Imperial Irrigation District, and $62 million to private landowners; and
  - Total economic benefit of $866 million or $29 million per year.
- Three power generation projects would:
  - Offset 32 million tons of Carbon Dioxide; 1,143 tons of Nitrogen Dioxide; 62,644 tons of Sulfur Dioxide; and 14,668 tons of particulate matter.
  - Equal to 6 million passenger cars not driven for one year; 3 billion gallons of gasoline; or the electricity used by 3 million households for one year.

HI



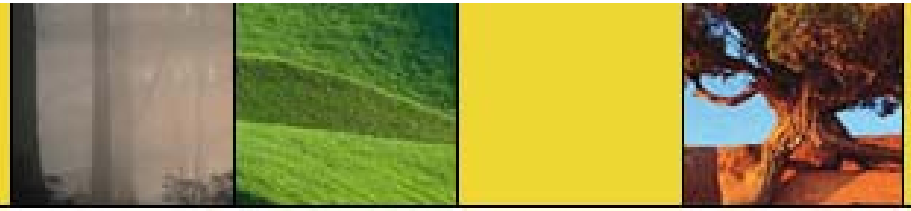
- Puna Geothermal Venture's (PGV) 30-MWw geothermal plant has been in commercial operation since April 1993. It currently provides about 20% of the electrical power for the Island of Hawaii. Waste heat may be available for direct use.

- The GPW program, through working group and funding support, is enabling the County of Hawaii to investigate geothermal direct use applications using waste heat from geothermal operations or wells.

- PGV's off-peak power from current geothermal operations, estimated to be in the range of 36 to 72 MWh per day, offers opportunities for production of hydrogen..

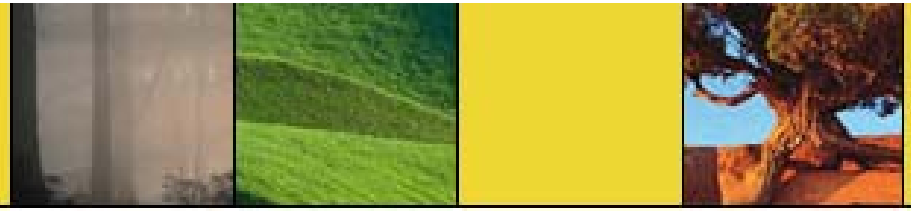
- "With continued GPW program support, Hawaii is looking forward to exploring the use of off-peak geothermal energy for the production of hydrogen."
  - Priscilla C. Thompson,
    Department of Business, Economic Development & Tourism,
    Strategic Industries Division

ID



- The Idaho Department of Water Resources' (IDWR) Energy and Technical Services Divisions has conducted several outreach efforts in the Gem State over the past few months.
  - Sponsored Harvesting Clean Energy Conference in Spokane on 27-28 February. Idahoan Leo Ray, who raises catfish, sturgeon, tilapia, trout, and alligators in geothermal water, discussed his thriving business.
  - Co-sponsored 2006 Farm Bill Renewable Energy Grants workshops in late January. About 175 people attended sessions in Boise, Twin Falls, Pocatello, Idaho Falls, and Cascade. The presentations and discussions focused on wind and geothermal applications under the renewable energy systems and energy efficiency improvements grant program, and the value added producer grant and loan guarantee programs.
  - On 24 January, hosted the geothermal power production webcast in its Boise office.
  - On 5-6 January, the Intermountain West Geothermal Working Group conducted a meeting in Boise to discuss the status of DOE's geothermal programs, how to build relationships with the industry, methods of complementing the federal geothermal programs, and industry's research and training needs. Doug Glaspey of U.S. Geothermal updated the attendees on the progress of re-opening the Raft River geothermal power production plant in Cassia County.
  - Hosted the Third Geothermal Energy Team meeting in Cascade on 7 December 2005.

NE

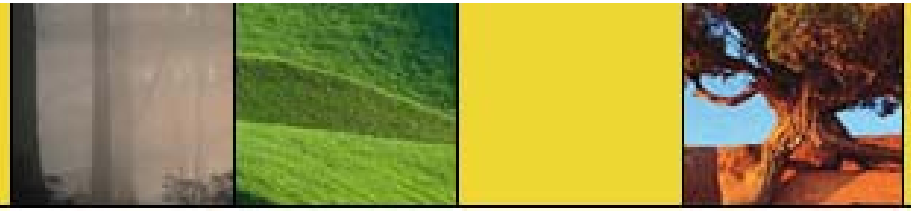


- With support from GPW, the Geo-Heat Center conducted a life-cycle cost analysis for various heating, ventilating, and air-conditioning (HVAC) systems for proposed new office building on the Winnebago Reservation in northeastern Nebraska.

- The GHP system has a simple payback period of 6.6 years.

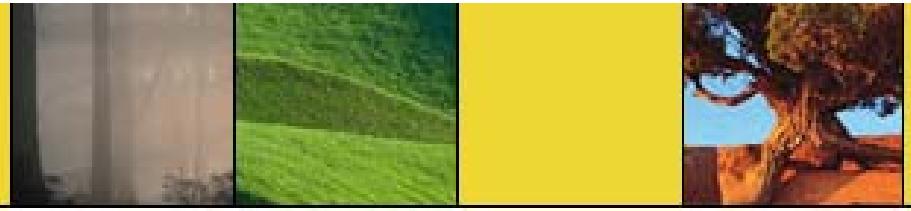
- A GHP system can reduce annual greenhouse gas emissions by 15 tons of CO_2 equivalent over the use of rooftop units with gas heat, and by 33 tons of CO_2 equivalent over the use of air source heat pumps.

MT



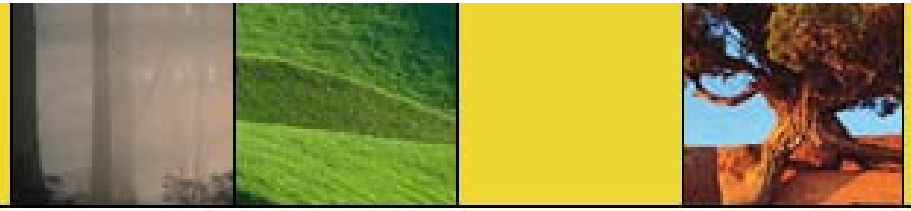
- Will hold first meeting of geothermal working group in March.
- Already fielding questions from people who want to develop geothermal resources for direct uses.

NV



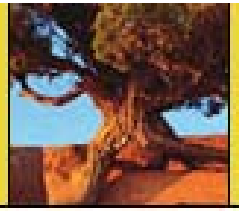
- Ethanol projects fueled by geothermal are being studied in Washoe, Lyon, Churchill, and Humboldt counties.
- Several projects from smaller companies moving into relatively unknown geothermal resources areas for test drilling.
- Navy is moving forward with resource assessment in Hawthorne.
- Pyramid Lake Indian tribe is drilling and evaluating their geothermal resource with good results so far. A second tribe may follow.
- Numerous domestic heating wells going in throughout the state; interest in these wells has greatly increased in the last year.
- Geothermal direct use being looked at near Wabuska.
- Great Basin Center for Geothermal Energy at University of Nevada, Reno conducts research to identify undiscovered resources, contributes to outreach activities, and trains students.

NV – cont'd



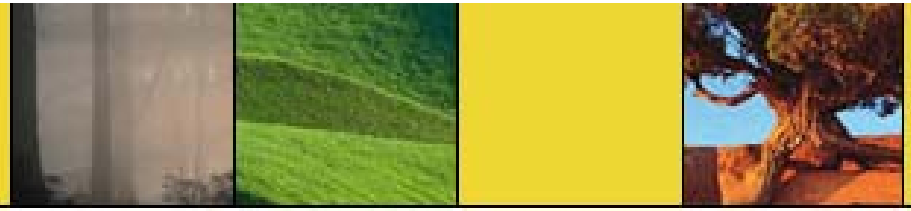
- GeoPark– Elko
  - Expands Elko Heat Co. geothermal district heating system (currently at 20% of capacity).
  - First geothermally-heated industrial park of its kind.
  - Will attract businesses by offering lower operating costs.
  - Geothermal could displace 61,000 therms of natural gas a year.
  - 100,000 ft^2 of floor space.
  - Geo-Heat Center through GPW.

NV – cont'd



- Mt. Grant General Hospital – Hawthorne
  - Currently heated with 40-year old fossil-fuel fired boilers.
  - A known geothermal resource exists in the Hawthorne area.
  - Hospital serves a population of approximately 5,000 residents.
  - Hawthorne Army Depot (HWAD), a government-owned, contractor-operated military industrial installation employing 700 personnel and national guard troops.
  - Geo-Heat Center will conduct feasibility study of utilizing geothermal energy for heating the hospital. The proposed project will provide the information needed by hospital staff to determine the feasibility and cost effectiveness of installing geo-heat systems.

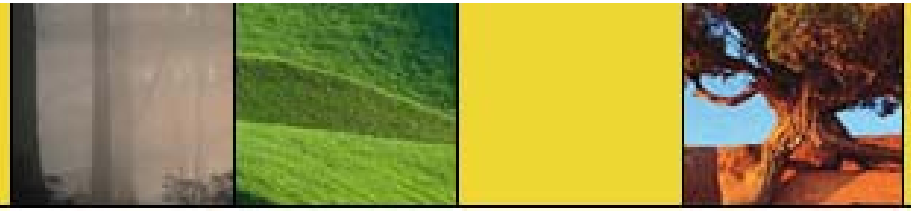
NV – cont'd



- "Without DOE funding in 2006 onward, the exploration and discovery of new resources and new projects putting energy on line is going to be severely impacted. Already, projects envisioned for this year are on hold. A sad state of affairs considering our presidential mandate to kick the oil habit."
  - Christy L. Morris

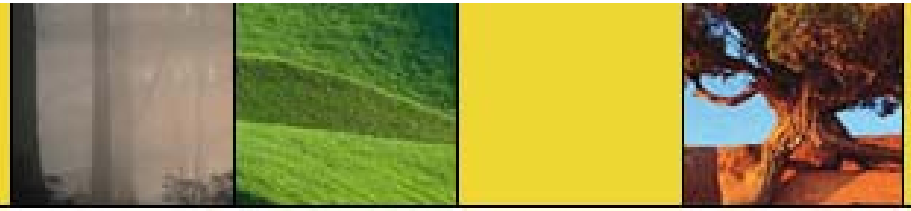
    Oil, Gas, and Geothermal Program Manager
    Nevada Division of Minerals

NM



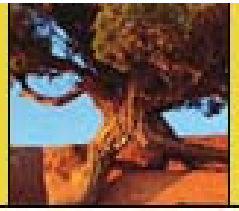
- 16-17 May 2006 - Annual meeting of the New Mexico Geothermal Energy Working Group in Albuquerque.
  - Technical sessions on geothermal direct use, power generation, and heat pump systems.
  - Updates on New Mexico's geothermal work-in-progress, water issues, and the renewable energy production tax credit law.
  - Geothermal site tour to the Jemez Springs area is planned.

OR



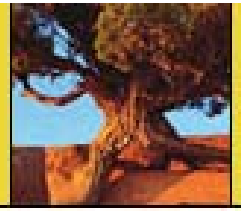
- Geo-Heat Center of the Oregon Institute of Technology in Klamath Falls is conducting geothermal feasibility and engineering studies for projects in several states.
- Governor Ted Kulongoski has announced his intention to push for a 25% by 2025 RPS.
  - OR Geothermal Working Group will introduce geothermal in discussion.
- 20-21 March 2006 - The "Positioning Oregon as an International Leader in the Clean Energy Industry Conference" in Bend.
  - Geothermal will be represented.

TX



- 70+ individuals attended 1st Texas Geothermal Working Group Meeting on 7 November 2005.
- TX geothermal database has grown to over 500 in one year.
- Rural development: Geothermal can assist rural areas by keeping and creating jobs in fields of agriculture, aquaculture, mechanical engineering, and oil and gas.

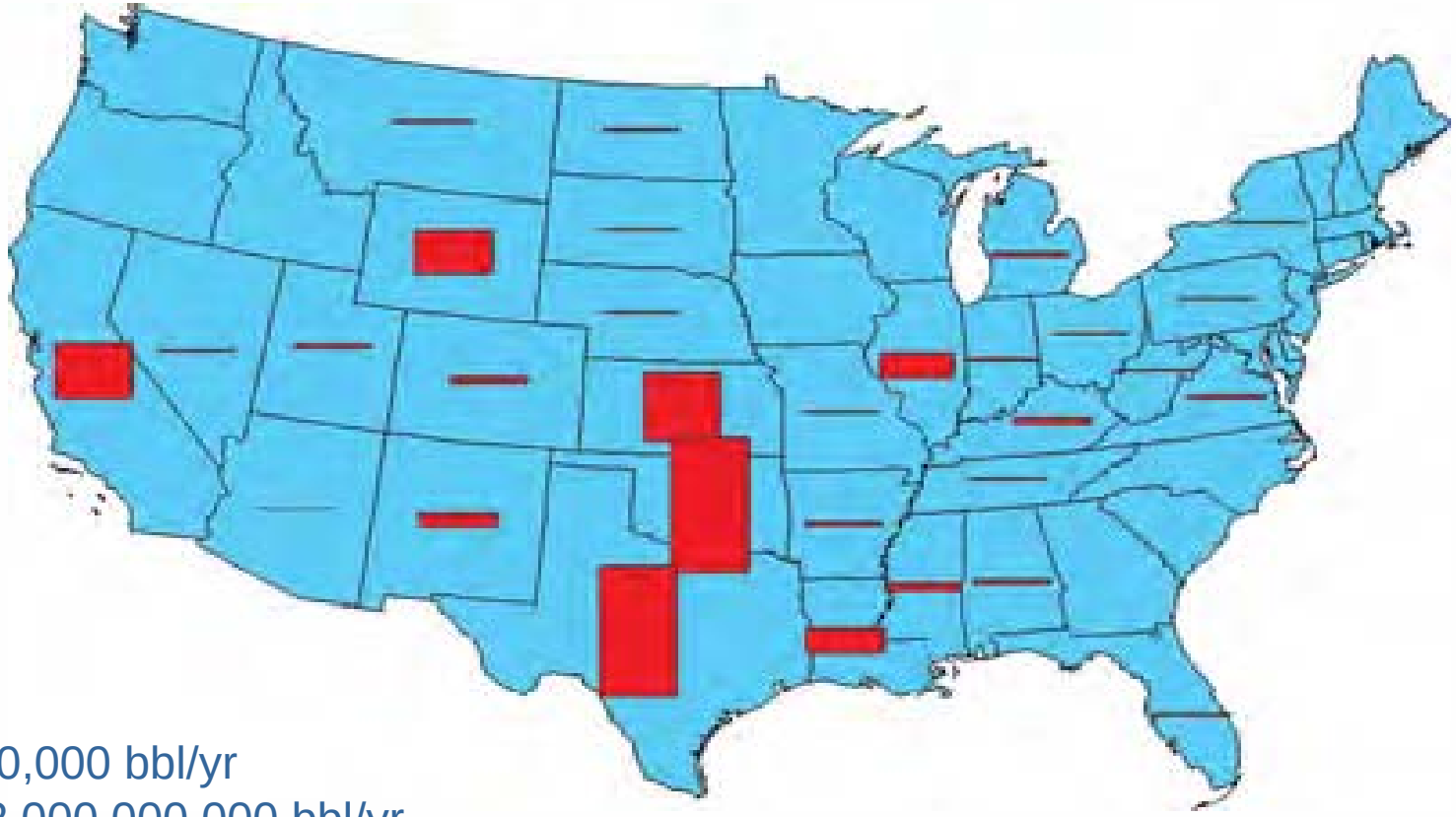
TX – cont'd



- 13-14 March 2006: Geothermal Energy Generation in Oil and Gas Settings in Dallas
  - Advancements in small scale binary power plant technology have made oil and gas wells feasible locations for new geothermal production, particularly along the Gulf Coast.
  - Texas has a potential of producing over 400 MW of electricity from waste water being discharged by oil and gas wells.
  - TX Geothermal Working Group has invited 536 Oil and Gas companies.

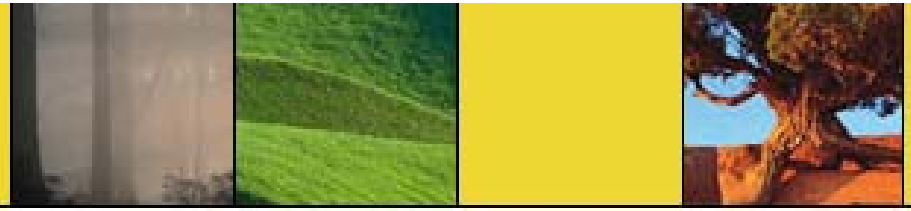
TX – cont'd

U.S. Total Water Processed from Oil & Gas Wells
Curtice & Dalrymple, 2004.



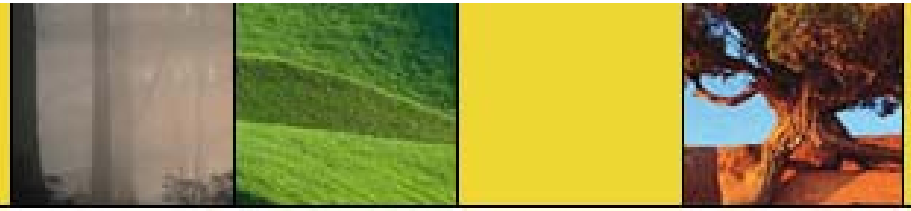
Min = 200,000 bbl/yr
Max = 12,000,000,000 bbl/yr

UT



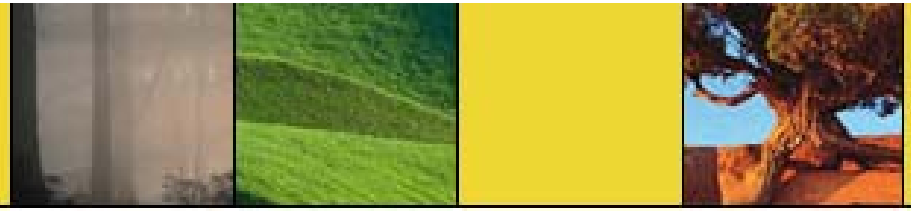
- 22-23 March 2006: Ground-Source Heat Pumps and Geothermal Direct Use Workshop in Salt Lake City
  - Co-sponsored by GPW, Sound Geothermal, the Geo-Heat Center, the Washington State University Energy Program, the University of Utah Energy and Geoscience Institute, and Utah Geological Survey's State Energy Program.

WA



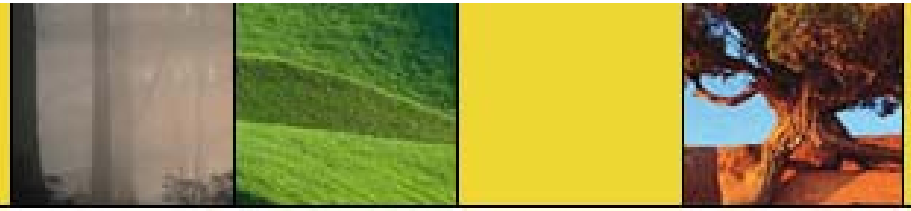
- Washington State University’s Energy Program has received many requests for technical assistance from several states.
- “With this level of interest we should see quite a bit on new geothermal direct use development over the next years if future funding is available. If not the studies will sit on someone's desk.”
  - Dr. Gordon Bloomquist,
    Geothermal, Hydrothermal and Integrated Energy Systems,
    Washington State University Energy Program

WY

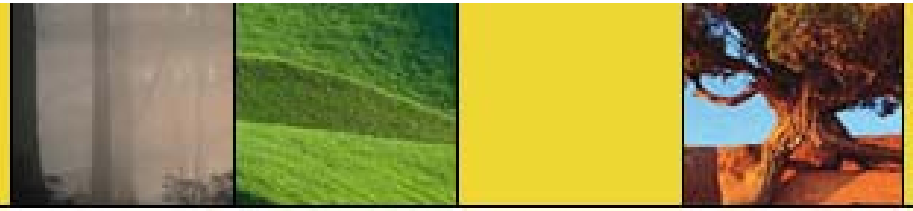


- “We continue to gain ground (no pun intended but taken) on getting some projects moving forward. To date we have a couple of highly interested prospects for direct use but nothing that we can report yet.”
  - Ed Werner,
    Business Development Director,
    Converse Area New Development Organization

UGWG



- Utility Geothermal Working Group (UGWG) formed to promote the use of geothermal energy to all of the country's electric cooperatives and municipal utilities.
- Works with the American Public Power Association and the National Rural Electric Cooperative Association (NRECA)
- More than 1,000 electric cooperative managers and directors visited GPW booth at NRECA annual TechAdvantage Conference and Expo in Orlando in February.
- Has conducted a series of geothermal webcasts and workshops for electric utilities. Two upcoming: 14 March on Direct Use and 18 April on GeoExchange.
- "It's very unlikely that these utilities would have any notion where to gain the information and technical expertise needed to make decisions about the appropriate geothermal applications for their service territories should we [the UGWG] not be here to help them and guide them to the initial technical assistance information and resources."
  - Randy Manion,
    Manager, Non-Hydro Renewable Resource Program
    Western Area Power Administration



Conclusion

- What is happening in the states? *A lot.*
- Why? *Because of GeoPowering the West.*
- DOE's GPW is *critical* to increasing the use of geothermal energy for direct use and power generation.
- Without GPW, state-level activities would *not* have happened.

Without GPW

With GPW