



Tools for On-Farm Geothermal Development

Harvesting Clean Energy Conference
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Outline

- Possible on-farm uses of geothermal heat and hot water
- Geothermal-biz.com
- Whom to contact in your state
- Other important tools
- Conclusion

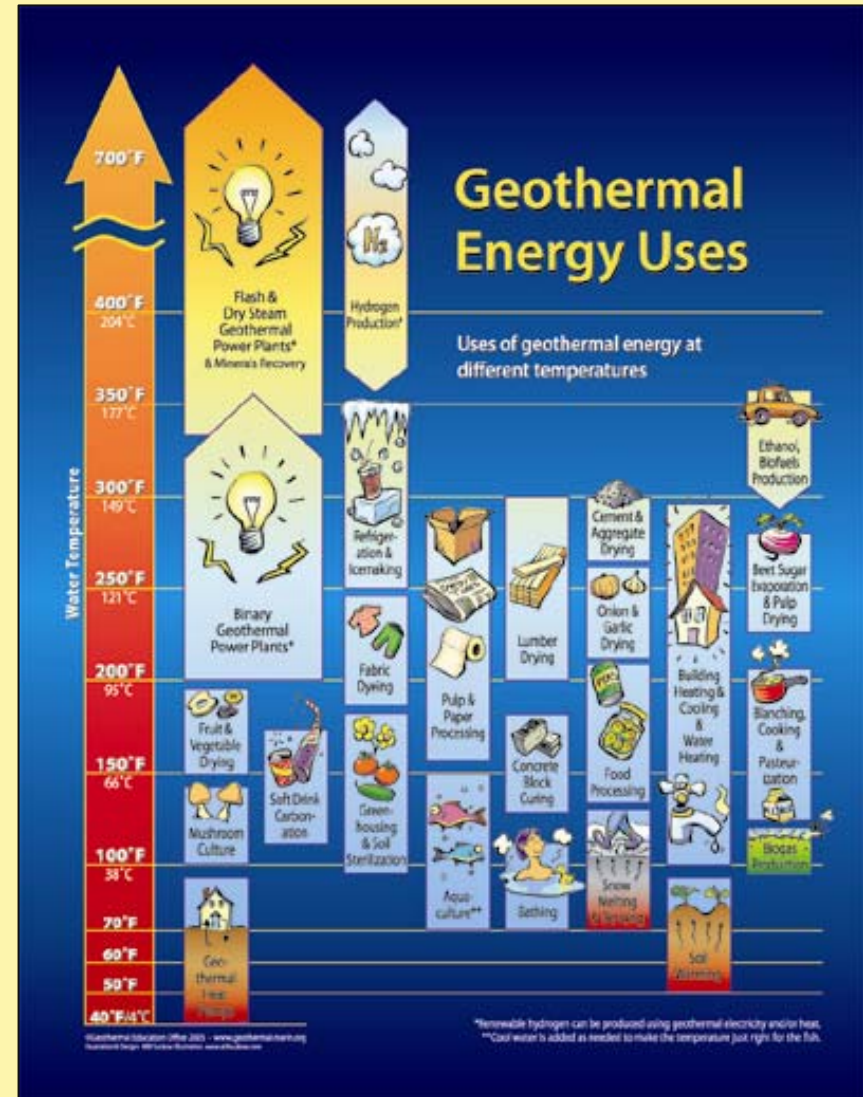


Possible on-farm uses of geothermal

- Depends on resource temperature
- Direct use
 - Uses heat from water directly
 - Low temperature
 - Generally $> 70^{\circ}\text{F}$
- Electricity generation
 - Requires hotter resource
 - Generally $> 212^{\circ}\text{F}$
- Cascaded uses most economical

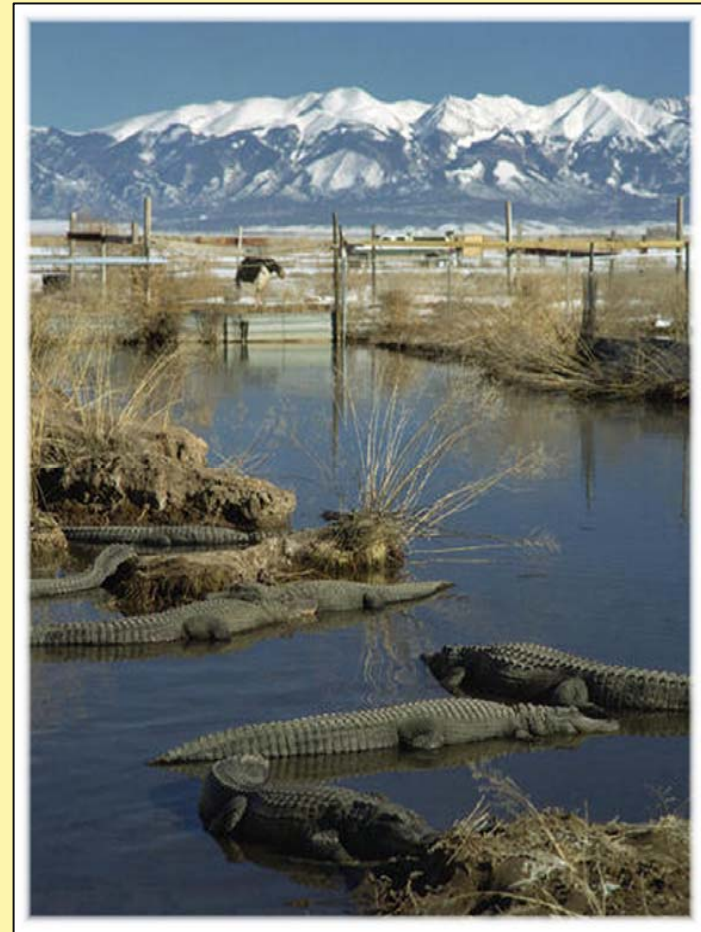
Possible on-farm uses of geothermal

- Aquaculture (59°F)
- Space and water heating (100°F)
- Greenhouses and soil sterilization (100°F)
- Pasteurization (125°F)
- Food processing (140°F)
- Fruit and vegetable drying (150°F)
- Onion and garlic drying (200°F)
- Beet sugar evaporation and pulp drying (225°F)
- Refrigeration and ice making (250°F)



Aquaculture

- Optimum growth temperature requirements:
 - Depends on species
 - 59-90°F
- Cost of establishing business depends on:
 - Size of project,
 - Species raised, and
 - Whether a well already exists
- Average aquaculture business has 6 employees and annual sales of > \$400,000.



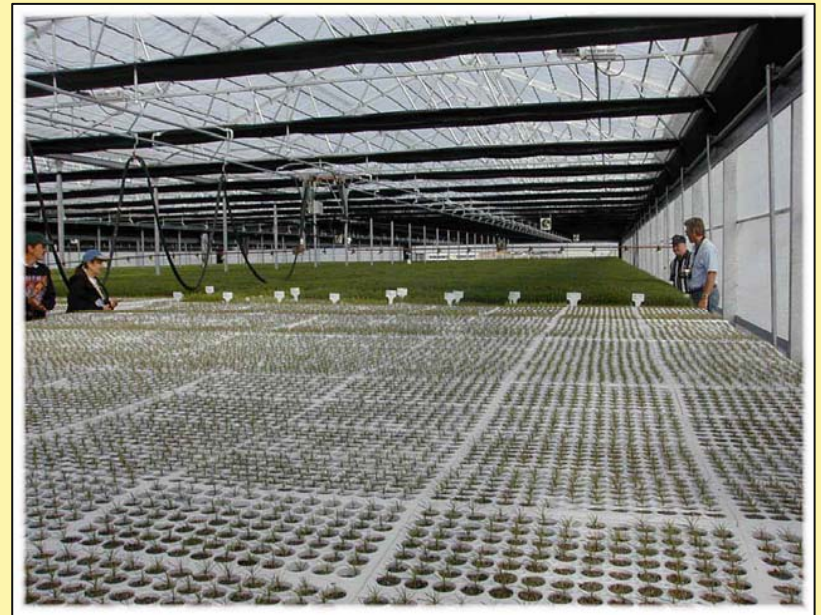
Space and water heating

- More than 120 operations in U.S. use geothermal energy for district and space heating.
- Well depths vary: 275 ft at Pagosa Springs, 3,030 ft in Boise.
- Temperatures vary: 138°F to 218°F.
- Retrofit costs depend on existing system.

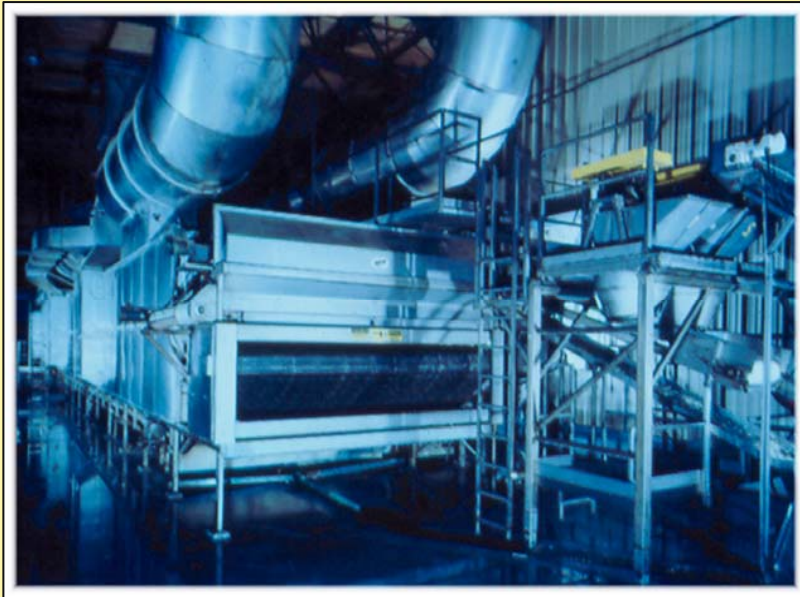


Greenhouses

- Capital costs vary by project size, location, material used, and whether a well currently exists.
- Approximate costs:
 - Total greenhouse costs (includes greenhouse and operating equipment) are \$13.50-17.00/ft² of greenhouse.
 - A “backyard” 1,000ft² greenhouse costs approximately \$15,000.
 - 1-acre greenhouse costs about \$660,000.



Agricultural processes



- Applications include food dehydration and milk pasteurization.
- Dehydration of vegetables and fruits is the most common industrial use of geothermal energy.
- Temperatures range from 86-356°F.

- Created in 2002 to help geothermal entrepreneurs develop geothermal direct use and small power generation projects.
- Supported by the U.S. Department of Energy's (DOE) GeoPowering the West (GPW) Program.



Geothermal-biz.com

- Calendar of Events
- Newsletter
- Financing Information
- Leasing & Permitting
- Why Geothermal?
- FAQs
- News
- www.Geothermal-biz.com

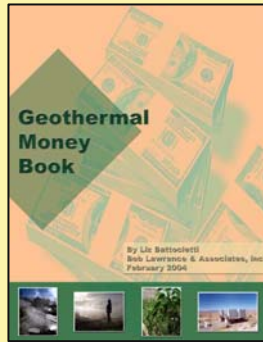
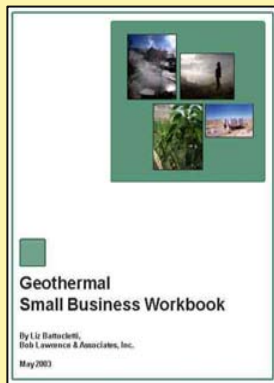
The screenshot shows the Geothermal-biz.com website in a Netscape browser window. The browser title is "Geothermal-biz.com: Welcome - Netscape". The address bar shows "http://geothermal-biz.com/home.htm". The website header includes the logo "Geothermal biz.com" and navigation links for "FAQs", "News", "State Info", and "Contact Us". The main content area is divided into two columns. The left column contains a vertical menu of links: "Calendar of Events", "Current Solicitations", "Subscribe to Newsletter", "Financing Information", "Leasing & Permitting", and "Why Geothermal?". Below this menu is a map of the United States with a caption: "Click on the map below to go directly to the webpage for your state." The right column features a "Welcome to Geothermal-biz.com" section with introductory text and a "What's New" section with three bullet points: "What's New", "Public Service Announcements", and "GPW State Leads". At the bottom right, there is a "What's New" section with a table of recent updates.

Date	Update
25 February	February 2006 Geothermal-biz.com Newsletter available.
25 February	Supported by DOE's GeoPowering the West Program, Idaho National Laboratory and the Geo-Heat Center have created a template (5.0 MB PDF) to help applicants successfully apply for grant funding from the USDA Section 9006 program.
25 February	The State Energy Program of the Utah Geological Survey is seeking a full-time Renewable Energy Coordinator. needed. Interested parties should apply by 7 March 2006. For more information .
15 February	USDA Renewable Energy Systems and Energy Efficiency Improvements Grants and Guaranteed Loans —Applications due 12 May 2006.
13 February	Ethiopia Tendaho Geothermal Site Feasibility Study —Proposals due 30 March 2006.
7 February	13-14 March 2006 - First-ever Geothermal Energy Generation in

- *Free resources*
- Small business development and financing
 - Geothermal Small Business Workbook
 - Geothermal Money Book
- “An Introduction to Geothermal Permitting”
- Geothermal-biz.com newsletter
- Links to other sources of information

Geothermal small business workbooks

- Published May 2003 and Feb. 2004.
- Books help people:
 - Understand geothermal applications,
 - Write a business and financing plan and financing proposal, and
 - Identify potential financing sources.
- Available in PDF format on Geothermal-biz.com website or on CD-ROM by request.
- To date, over 380 have people have received the CD-ROM.
- Countless copies have been downloaded from website in PDF format.





Geothermal small business workbooks

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Geothermal Small Business Workbook

- Provides background, market, and regulatory data for direct use and small-scale (< 1 MW) power generation geothermal projects;
- Refers you—the geothermal entrepreneur, small company, or project developer—to several sources of useful information including owners of existing geothermal businesses, trade associations, and other organizations;
- Breaks down the complicated and sometimes tedious process of writing a business plan into five easy steps;
- Leads you step-by-step through the process needed to structure a business and financing plan for a small geothermal project; and
- Helps you develop a financing plan that can be adapted and taken to potential financing sources.



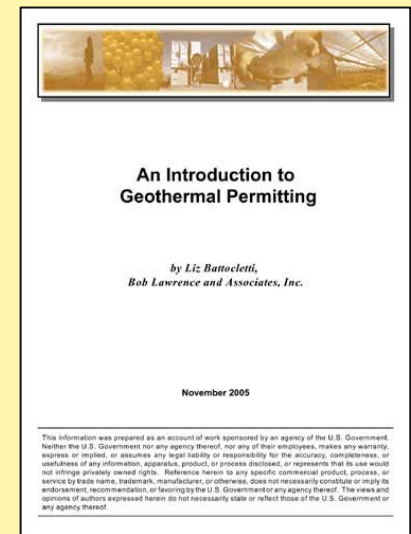
Geothermal Money Book

- Explains the specific criteria potential financing sources use to evaluate a proposal for debt financing;
- Describes the Small Business Administration's (SBA) programs to promote lending to small businesses;
- Lists specific small-business friendly lenders for small geothermal businesses, including those which participate in SBA programs;
- Identifies federal and state incentives which are relevant to direct use and small-scale (< 1 MW) power generation geothermal projects; and
- Provides an extensive state directory of financing sources and state financial incentives for the 19 states involved in GPW.



“An Introduction to Geothermal Permitting”

- Helps geothermal entrepreneurs, small businesses, and developers better understand the permitting process.
- Provides a brief and basic introduction to geothermal permitting at the federal, state, and local levels, and in Indian Country.
- Addresses the following questions:
 - What is the importance of where the geothermal resource is located?
 - How does the Federal Government define geothermal?
 - What is a surface managing agency?
 - What kinds of permits do I need?
 - How does my state define geothermal?
 - What state agencies issue geothermal permits in my state?
- Published November 2005.
- Available in PDF format.
- http://geothermal-biz.com/Docs/Intro_to_geo_permitting.pdf





Geothermal-biz.com newsletter

- Tracks what is going on at the national level and in the 19 GPW states.
- Published bimonthly.
- Emailed to over 2,300 people.
- February 2006 issue lead stories:
 - “Geothermal program zeroed out in FY07 — Fight on to save vital DOE program”
 - “USDA FY06 grants and loans for renewable energy for ag producers and rural businesses”
- To be added to distribution list:
 - <http://geothermal-biz.com/news.htm#subscribe>



GPW State Contacts

- Alaska - David Lockard, Alaska Energy Authority
- Arizona - Amanda Ormond, The Ormond Group
- California - Elaine Sison-Lebrilla, California Energy Commission
- Colorado - Paul Bony, Delta-Montrose Electric Association
- Hawaii - Priscilla C. Thompson, Department of Business, Economic Development and Tourism, Energy, Resources, and Technology Division
- Idaho - Gerry Galinato, Energy Division, Idaho Department of Water Resources
- Montana - Kathi Montgomery, Montana Department of Environmental Quality
- Nevada - Christy Morris, Nevada Division of Minerals
- New Mexico - Brian K. Johnson, New Mexico Energy, Minerals and Natural Resources
- Oregon - Carel C. DeWinkel, Oregon Department of Energy
- Texas - David Blackwell and Maria Richards, Southern Methodist University
- Utah - Bob Blackett, Utah Geological Survey
- Washington - Gordon Bloomquist, Washington State University Energy Program
- Wyoming - Ed Werner, Converse Area New Development Organization



Other important tools

- USDA Renewable Energy Systems and Energy Efficiency Improvements Program (Section 9006) authorized under Title IX, of the 2002 Farm Bill
 - \$11.385 million for grants – due 12 May 2006
 - \$176.5 million in guaranteed loans – due 3 July 2006
- Template: “Fizer Dairy Geothermal Heating”
 - http://geothermal-biz.com/Docs/dairyproposal_final_2_20_06.pdf



Other important tools

- **Geo-Heat Center, Oregon Institute of Technology**
<http://geoheat.oit.edu/>
- **Geothermal Education Office**
<http://geothermal.marin.org>
- **Geothermal Energy Association**
<http://www.geo-energy.org/>
- **Geothermal Resources Council**
<http://www.geothermal.org/index.html>
- **DOE GeoPowering the West**
<http://www.eere.energy.gov/geothermal/gpw/>
- **DOE Geothermal Energy Program**
<http://www1.eere.energy.gov/geothermal/about.html>



Conclusion

- Geothermal heat and hot water have many commercial agricultural applications.
- A wide variety of tools exist to help farmers, ranchers, and rural landowners develop their geothermal resources.
- If you have a geothermal resource, we can give you the information you need to evaluate and develop it.



Whether you want to...

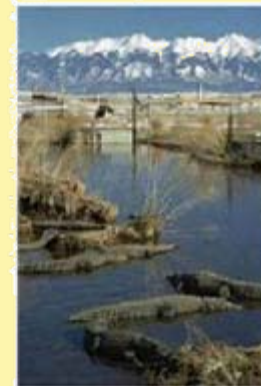


Grow flowers...



Whether you want to...

Nurture alligators...





Whether you want to...

Finance your geothermal business...





Whether you want to...



Or just learn more about geothermal energy...



Geothermal-biz.com can help.





Thank you

*This presentation will be posted on
the [Geothermal-biz.com](http://www.geothermal-biz.com) website.*



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