

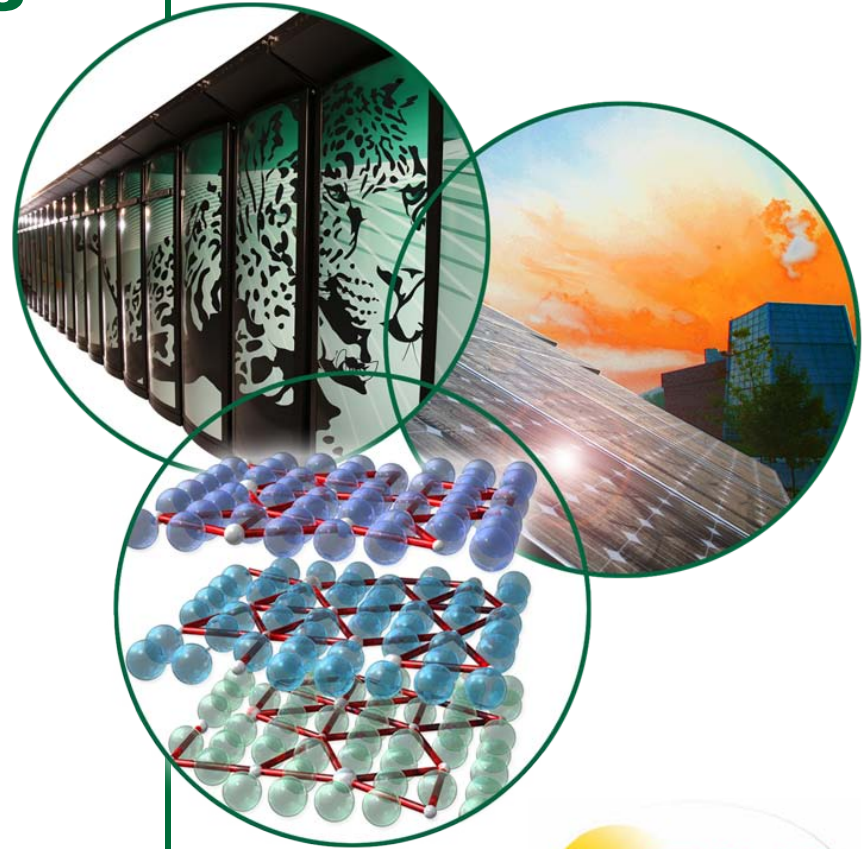
GHP Market Status, Barriers, and Methods to Overcome the Barriers

Geothermal Heat Pump
Technologies Webinar

by

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March 31, 2009



Report ORNL/TM-2008/232

- Sponsor
 - DOE Geothermal Technologies Program
- Question posed
 - Have policymakers mistakenly overlooked GHPs as a component of national energy/climate strategy?
- Where can I get report?
 - www.zebralliance.com

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Geothermal (Ground-Source) Heat Pumps:
Market Status, Barriers to Adoption, and Actions to
Overcome Barriers

December 2008

Prepared by
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Sponsored by
EERE Geothermal Technologies Program
U.S. Department of Energy



Scope

- **Determine status of global GHP markets**
 - Domestic GHP markets, industry, and technology
- **Assemble previous estimates of GHP energy savings potential and other benefits**
- **Identify key barriers to application of GHPs**
- **Identifying actions that could accelerate market adoption of GHPs**
- **Document findings in a report**

Status of Global GHP Markets

- **U.S. was once the world leader in GHP technology and market development**
 - Today domestic markets absorb ~60,000 units/yr
 - 50-60% residential (new exceeding retrofit by 3 to 1)
 - 40-50% commercial
 - U.S. still has the largest installed base
 - Per capita, many European countries are ahead
- **European markets are now 2-3 times the U.S.**
 - ~135,000 to 190,000 units/yr
- **Growth rates in Europe, parts of Asia (China, S. Korea), and Canada exceed U.S.**

Domestic GHP Markets, Industry, Technology

- **Markets**

- Who buys and why

- Institutional customers who take the life-cycle view
- Homeowners with wherewithal to finance and plans to occupy a long time

- Value proposition

- Simple payback: retrofit 8-12 yr, new is better but >5yr still common

- **Industry**

- Profitably serving a small niche

- Spotty design and installation infrastructure

- Too fragmented and resource-constrained to grow rapidly on own

- With policy-level assistance on barriers could grow rapidly

- **Technology**

- Simple, reliable, but not advancing (no R&D program)

Potential GHP Benefits Appear Significant†

- **Primary energy savings by 2030**
 - 3.4 to 3.9 quads annually (buildings today consume about 40 quads)
 - Residential about 60%
 - Of that ~20% new, ~80% retrofit
 - Commercial about 40%
 - Of that ~33% new, 67% retrofit
 - 35 to 40% of savings needed to keep buildings in 2030 at 2008 energy use level (per EIA projections)
- **Deferred electric generation capacity — 2030**
 - 91 to 105 GW
 - 42 to 48% of net new capacity additions by 2030 (per EIA projections)
- **Utility bill reductions in 2030**
 - \$33 to 38 billion/yr (assuming rates in 2030 = rates in 2006)

†Based on previous analyses by others for existing building retrofits, updated using current data, and supplemented with new construction savings estimate.

Key Barriers to Rapid Deployment of GHPs[†]

- Tier 1
 - High first-cost of GHP systems to consumers
- Tier 2
 - Lack of consumer knowledge and/or trust in benefits
 - Lack of policymaker/regulator knowledge and/or trust in benefits
 - GHP design and business model infrastructure limitations
 - GHP installation infrastructure limitations
- Tier 3
 - Lack of new technologies and techniques to improve GHP system cost/performance

[†]Based on the sense of a group of GHP industry experts.

Actions To Accelerate Market Adoption of GHPs†

- **Tier 1**

- Assemble independent, hard data on costs and benefits
- Independently access the national benefits of GHP deployment

- **Tier 2**

- Streamline/deploy REC programs to provide GHP infrastructure
- Universal access to GHP infrastructure via loop-leasing
- Develop data, models, tools enabling lowest LCC GHP infrastructure

Requires applied R&D

- **Tier 3**

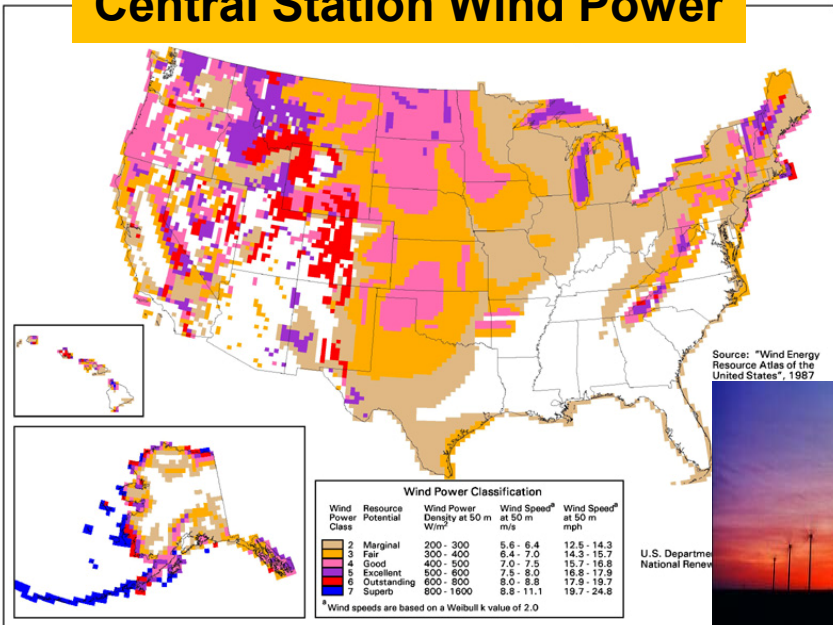
- Expand areas where high-quality GHP design infrastructure exists
- Expand areas where high-quality installation infrastructure exists

†Based on the sense of a group of GHP industry experts.

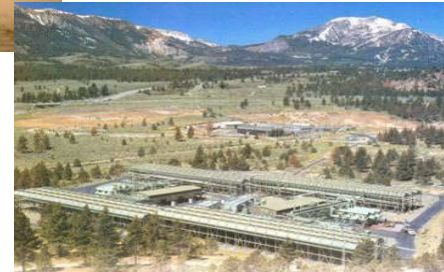
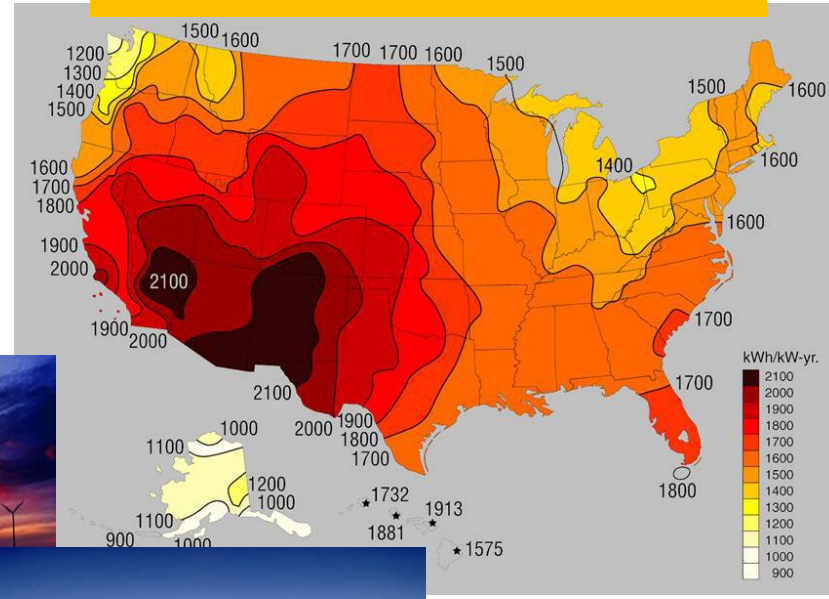
Primary Market Failure – Expecting Building Owners to Finance the ‘GHP Infrastructure’

- **‘GHP infrastructure’ is the outside-the-building part of the GHP system**
 - **Can be half or more of the overall GHP system cost**
 - **Rest of system about the same cost as conventional**
 - **Could be less in volume production**
- **‘GHP infrastructure’ is like utility plant**
 - **It moves energy**
 - **It outlives the building and many generations of heat pumps**
- **Why do we expect building owners to finance ‘GHP infrastructure’ on their own credit?**
 - **When we bring central station renewable energy to market the transmission lines will not be financed on building owner credit**
 - **Instead, as consumers of 72% of the nation’s electricity, building owners will pay for these transmission lines in their utility bills**

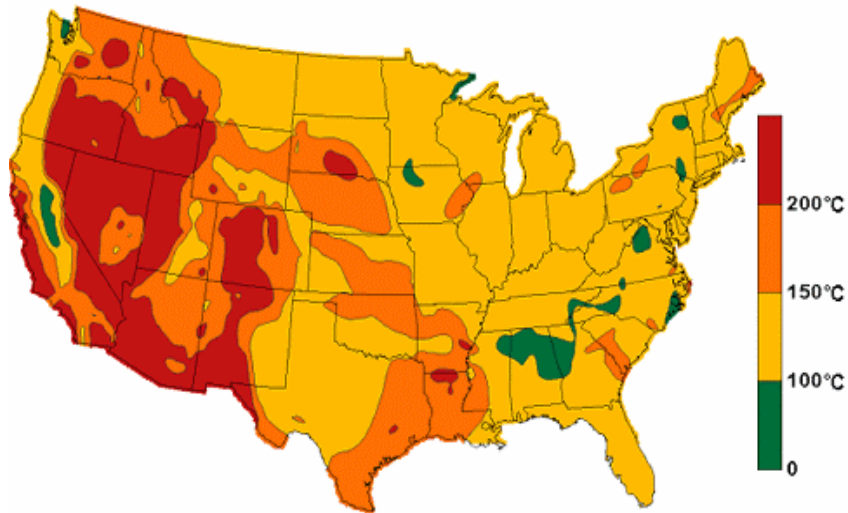
Central Station Wind Power



Central Station Solar Power

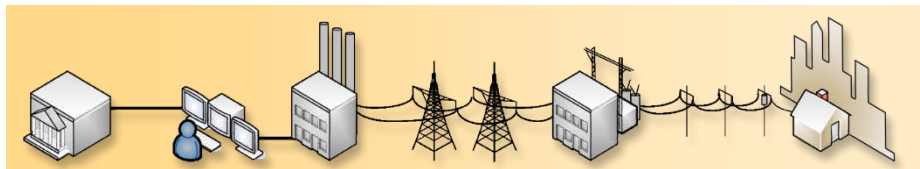


Central Station Geothermal Power

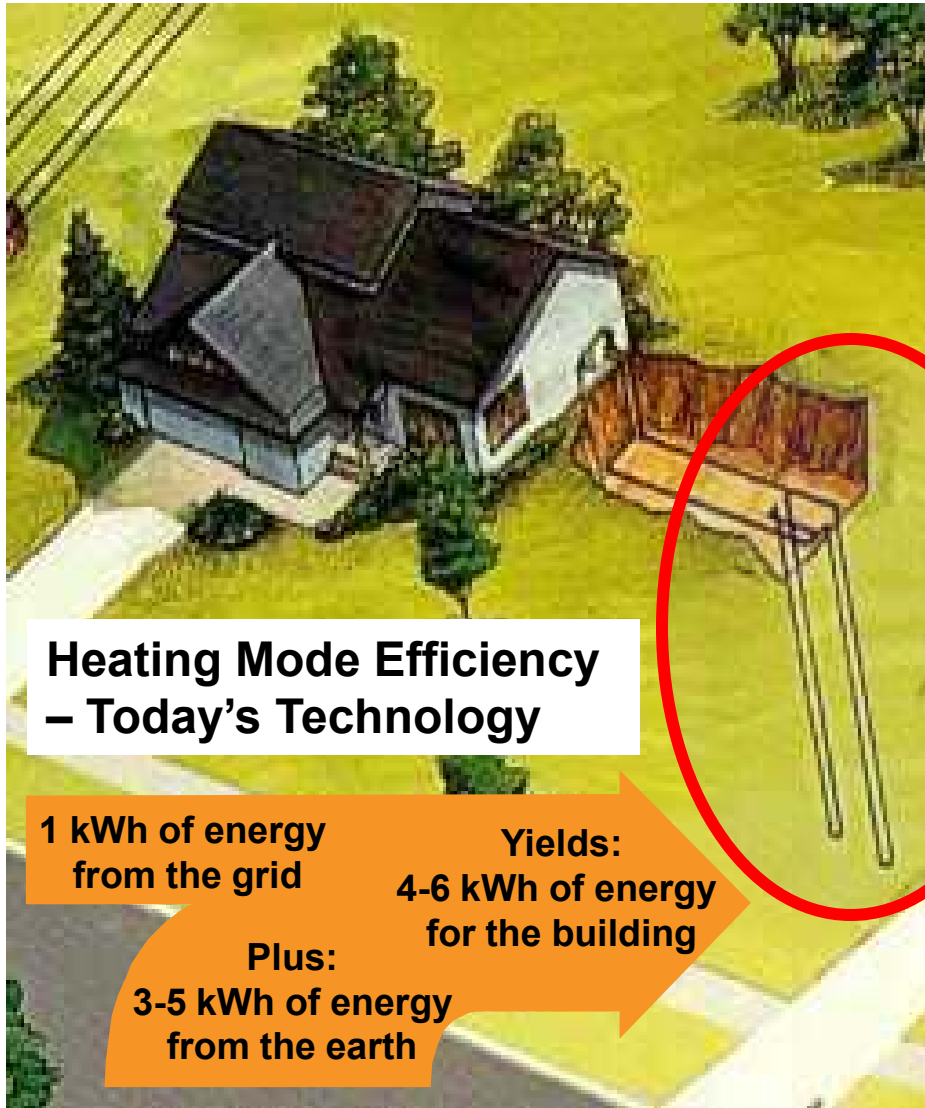


Temperatures at 6 km (3.75 mile) depth

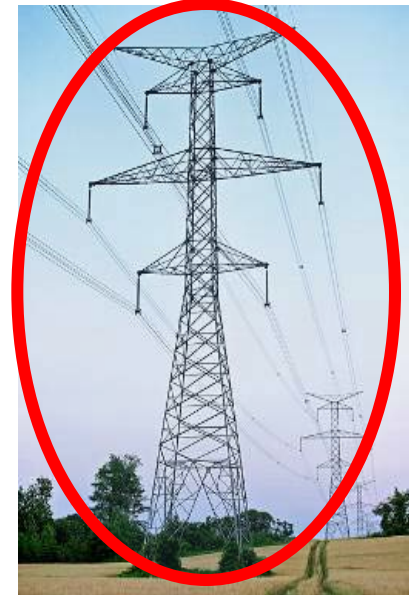
Buildings Use 72% of Electricity



GHP Infrastructure (Ground Heat Exchanger)



Another form of utility plant for delivering renewable energy supplies to the load



The American Recovery and Reinvestment Act of 2009 (ARRA)

- The conference agreement includes . . .
 - \$400,000,000 for geothermal activities and projects
- Whether any of this resource is applied to the advancement of the geothermal (ground-source) heat pump industry is at the discretion of DOE
- ARRA funding opportunity announcements (FOAs) are planned to be issued over the next few months
- FOAs for the DOE Geothermal Technologies Program are issued by the DOE Golden Field Office
 - Watch for posting at url:
<https://e-center.doe.gov/iips/faopor.nsf/ViewMenu?ReadForm>

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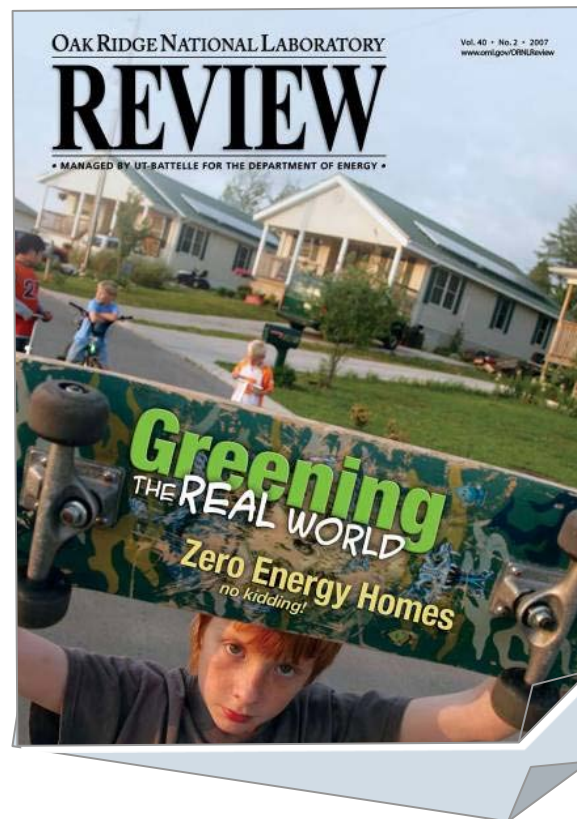
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