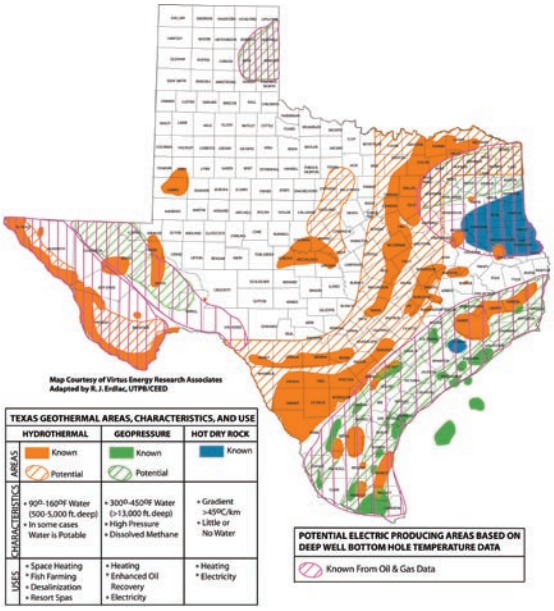
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Geothermal Technologies Program
Texas

(Geothermal Heat Pump Consortium PIX07201)

These inexpensive homes in an East Dallas development use geothermal heat pumps to greatly reduce energy requirements. Together with structural insulation panels, their ground source heat exchangers of 1,000 feet (305 meters) of polyethelene tubing in 250-foot (76-meter) wells, cut the heating and cooling cost for the homes in half. Geothermal or ground-source heat pumps are one of the most cost-effective renewable energy investments that can be made for a home or commercial building. More information is available from the International Ground Source Heat Pump Association http://www.igshpa.okstate.edu/ or the Geothermal Heat Pump Consortium http://geoexchange.com/.

Geothermal usage in Texas has historically been for heating or cooling with low-temperature resources (less than 100°C or 212°F). These resources are found primarily in two large areas, one along the Rio Grande in the Trans-Pecos region and another from the southern Rio Grande through the Balcones Trend in Central Texas, widening to cover most of East Texas. Major cities located near these areas include El Paso, Laredo, San Antonio, Austin, Dallas, Tyler, and Longview. Current applications are limited, but great potential exists. A Geo-Heat Center study identified more than 40 communities as good candidates for geothermal projects because they are within 8 km (5 miles) of a geothermal resource with a temperature of at least 50°C (122ºF).



Texas has many untapped geothermal resources that could potentially support energy development. One promising opportunity is to use the state's extensive network of oil and gas wells. Existing oil and gas wells connect to deeper geothermal resources, many with water as hot as 200°C (392°F). More than 12 billion barrels of water are currently produced each year from oil and gas wells in Texas. Heat from this water could be used to generate electricity using simple binary power systems.

Current Development

Geothermal waters in Marlin were used initially as a health spa and then for heating the state hospital built there. Current recreational hot spring developments include the Stacy Park Pool in Austin, built by the Works Project Administration in the 1930's, and Chinati Hot Springs (historically Kingston or Ruidosa Hot Springs), a small resort southeast of Marfa. Ground source heat pumps are used throughout the state for residences, schools, and commercial buildings. President George W. Bush's Crawford Ranch uses a ground source heat pump for heating and cooling of the ranch.

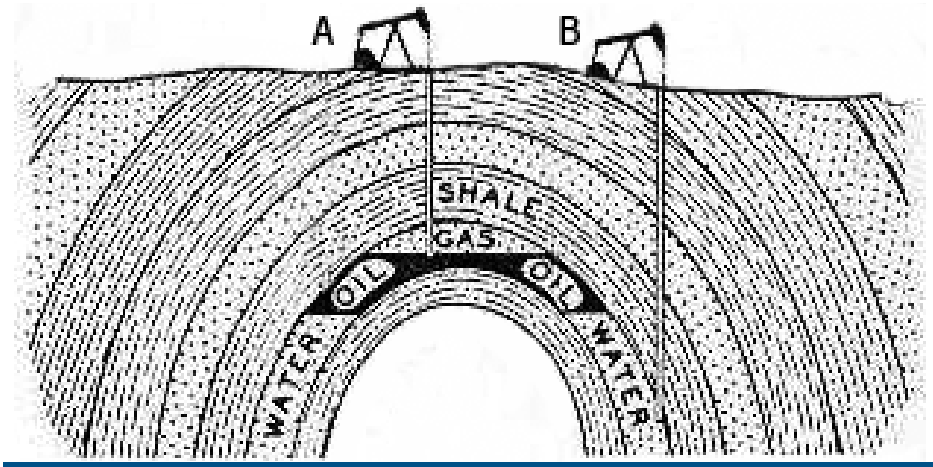
Potential Development

Although Texas's geothermal resources are mainly less than 100°C (212°F) near the Earth's surface, power generation is considered possible when higher temperature resources are available within reasonable depths—generally 120ºC (248ºF) within 4 km (13,123 ft). Extensive oil and gas well drilling in Texas provides widespread data to depths as much as 8 km (26,246 ft), indicating temperatures up to 180ºC (356ºF) in the west and to more than 200°C (392ºF) in the east. This suggests good potential for geothermal power generation from either current or abandoned oil and gas wells.

Oil and gas deposits are frequently mixed with fluids that get pumped to the surface along with the oil or gas. Because these fluids can come from 4 km (2.5 miles) to 8 km (5 miles) deep or from areas of unusually hot rock, they often carry substantial heat to the surface. By running these fluids through a binary power plant, this heat energy can be

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.



Utah Geological Survey

In a "classic" formation, geothermal water may be found along with oil and gas. To enhance oil or gas recovery from Well A, water or other fluid or gas can be pumped down the deeper Well B. For geothermal energy production, hot water can be pumped up from Well B and the spent water reinjected in Well A to keep the reservoir productive.

captured as electricity without interfering with current oil and gas production.

Abandoned wells also present a great opportunity for geothermal development. Data collection and well drilling are major portions of the cost of geothermal power development. Thus the use of current well data and existing wells may make it financially feasible to tap much deeper geothermal resources than would otherwise be possible. The University of Texas of the Permian Basin is currently studying gas well data to identify such potential projects in West Texas.

Another possible energy source occurs along the Texas-Louisiana Gulf Coast, where a large geopressure area extends into the Gulf of Mexico. Relatively unique high-pressure underground natural gas resources pose technical challenges, but offer three energy and revenue sources: mechanical energy from the pressurized natural gas, sale of the gas, and heat from the geothermal brine. The U.S. Department of Energy funded a successful demonstration of such a project from 1989-1991 at Pleasant Bayou, south of Houston.

Economic Benefits

Preliminary data from a Southern Methodist University Geothermal Lab study indicates the possibility of generating 500 MW to 2000 MW of electricity from existing oil and gas wells (McKenna et al, *Oil and Gas Journal*. September 5, 2005, p. 39) or more (Erdlac, personal communication). The electricity could be used to offset the oil and gas industry's own electrical needs and surplus used by surrounding communities.

Geothermal or ground-source heat pumps are one of the most cost-effective renewable energy technologies available for buildings. By pumping a heat-transfer fluid through a network of pipes in the ground, they use the relatively constant-temperature earth as a heat source in the winter and a heat sink in the summer, greatly reducing the amount of energy needed for heating and cooling. Schools, commercial buildings, greenhouses, and aquaculture are all prime potential beneficiaries of ground-source heat pump installation.

Policy

Texas has increased its renewable portfolio standard (RPS) to now require electric utilities to generate 5,880 megawatts of power from renewable energy, including geothermal, by 2015 and 10,000 megawatts by 2025.

As part of the U .S. Department of Energy GeoPowering the West Program, the State of Texas Energy Conservation Office is coordinating an initiative through the Southern Methodist University Department of Geological Sciences Geothermal Lab to develop a statewide geothermal energy program. The Energy Conservation Office is also working with the Center for Energy and Economic Diversification of the University of Texas at the Permian Basin on geothermal research.

GeoPowering the West

GeoPowering the West is a cooperative federal, state, and local effort to promote awareness of the vast geothermal energy resources in the western United States, including Alaska and Hawaii. GeoPowering the West partners with businesses, government officials, Native American groups, utilities, and energy consumers to expand the use of geothermal energy.

For more information contact:

EERE Information Center
1-877-EERE-INF (1-877-337-3463)
eereic@ee.doe.gov
www.eere.energy.gov

Southern Methodist University Geothermal
David Blackwell (214) 768-2745
Maria Richards (214) 768-1975
mrichard@smu.edu
www.smu.edu/geothermal

Texas State Energy Conservation Office
Pam Groce (512) 463-1889
pam.groce@cpa.state.tx.us
www.infinitepower.org

University of Texas Permian Basin CEED
Richard Erdlac (432) 552-2442
Erdlac_R@utpb.edu
www.utpb.edu/ceed/index.htm

Texas Bureau of Economic Geology
Scott Tinker, Director (512) 471-0209
scott.tinker@beg.utexas.edu
www.beg.utexas.edu/

U.S. Department of Energy
GeoPowering the West
Roger Hill, Technical Director, (505) 844-6111
rrhill@sandia.gov

Produced for the
U.S. Department of Energy (DOE)
Energy Efficiency and Renewable Energy

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

1000 Independence Avenue, SW
Washington, DC 20585

By the National Renewable Energy Laboratory,
a DOE National Laboratory

DOE/GO-102006-2213
April 2006

Printed with a renewable source ink on paper containing at least 50% wastepaper, including 10% postconsumer waste.