

Can Renewable Energy Meet the Urgent Challenge of Climate Change? **The Role of Geothermal Energy**

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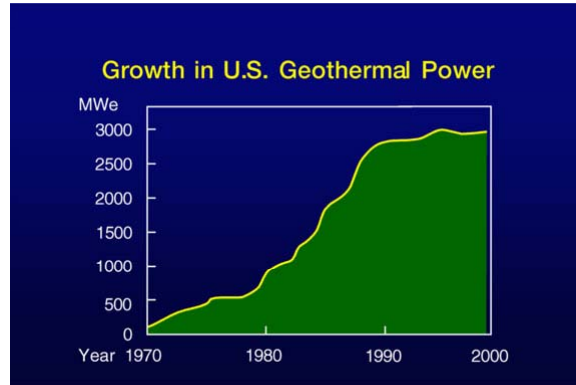


www.geo-energy.org

Geothermal Resources Represent a Multifaceted Energy Resource

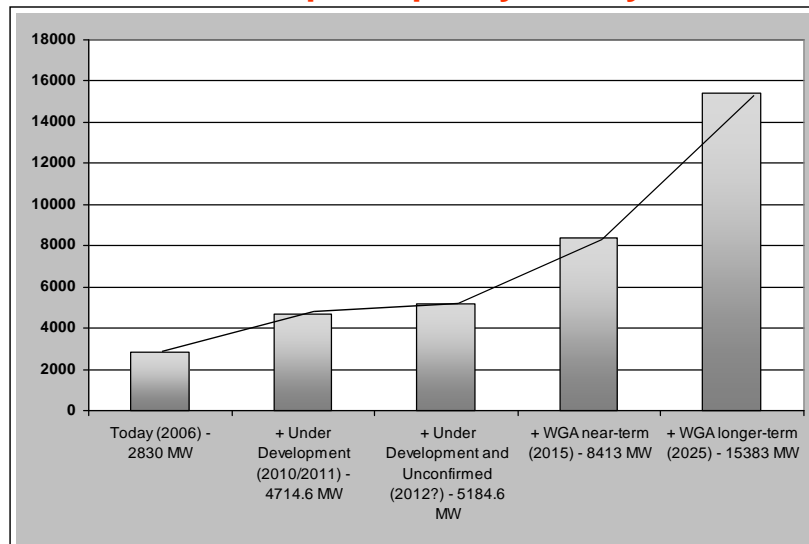
- Utility Scale Power
- Distributed Power Generation
- Heat Use for Agriculture and Aquaculture
- Heat for Commercial Buildings and Homes
- Combined heat and power
- Heat and power from oil wells
- Geopressured resources – gas/high pressure/hot water
- Carbon sequestration
- Hydrogen source
- Mineral production – zinc, lithium, rare earths
- Recreation


Power production trends



GEOTHERMAL POWER POTENTIAL BY 2025

We can triple capacity in 10 years





National Renewable Energy Laboratory
Innovation for Our Energy Future


A national laboratory of the U.S. Department of Energy
 Office of Energy Efficiency & Renewable Energy

Geothermal— The Energy Under Our Feet

Geothermal Resource Estimates for the United States

Bruce Green and Gerry Nix,
 National Renewable Energy Laboratory

Technical Report
NREL/TP-840-40665
November 2006



NREL Geothermal Estimates

	Estimated Developable Resource*		
	2015 (MWe)	2025 (MWe)	2050 (MWe)
Shallow Hydrothermal ¹ (Identified) >90°C/194°F	10,000	20,000	30,000
Shallow Hydrothermal ¹ (Unidentified) >150°C/302°F	TBD	TBD	TBD
Co-Produced & Geopressed ²	10,000 to 15,000	70,000	>100,000
Deep Geothermal ⁴	1000	10,000	130,000
Thermal Uses	(MW)	(MW)	
Direct Uses ⁵	1600	4,200	45,000
Geothermal Heat Pumps ⁶	18,400	66,400	>1,000,000
GHP ⁶ Avoided Power	2,100	8,000	120,000

NREL's Fine Print

- **Please note these resource estimates represent a consensus of a group of experts who considered existing resource assessments. There is considerable uncertainty in the estimates as many resources are hidden, and exploration to date has been relatively limited. The figures shown above are not a resource assessment, but, even with uncertainty, clearly show that the U.S. geothermal resource is a very large and important domestic energy source.**

Why We Don't Use More Renewable Energy, What EIS has to say:

- ***Renewable energy sources and generating technologies are environmentally benign compared with fossil fuel and nuclear technologies, but there are two main reasons why we don't use more renewable energy.***
- ***1) Renewable Energy is Expensive and Capital-Intensive: Renewable energy plants are generally more expensive to build and to operate than coal and natural gas plants.***
- ***2) Renewable Resources Are Often Geographically Remote: The best renewable resources are often available only in remote areas, so building transmission lines to deliver power to large metropolitan areas is expensive.***
- From EIA Report: How much renewable energy do we use? May 1, 2008

Achieving Geothermal's Potential

- There are many different actions that are still critical if geothermal energy is to achieve its potential. While we believe the potential of geothermal resources to be substantial, there need to be complementary policies and programs to achieve this potential.
- These programs and policies should cover the full range of geothermal resource potential.
- There need to be stable, long-term policies that promote investment and ensure markets for geothermal energy.
- There needs to be research and demonstration support for both near-term applications and long-term research.
- There needs to be continued attention to streamlining leasing and permitting.

Crosscutting Observations

- Regardless of the establishment of a cap-and-trade system, this country needs stronger long-term policies to encourage renewable energy development and we don't have them now.

Raising the cost of carbon will not promote low- zero-carbon energy sources quickly enough. (Any more than gas price increases can promote mass transit if there has not been an investment in mass transit infrastructure.)

The current tax system works against high investment options, and favors high consumption alternatives. Stable, long-term incentives can offset this imbalance.

We need to allocate major dollars on research, development and demonstration for low- and zero-carbon technologies.

The transmission infrastructure needs to be capable of delivering renewable energy to consumers – federal and state processes need to change.