

Geothermal Energy

The DOE FY 2002 budget proposes a 50% cut in the already underfunded geothermal research program. The members of GEA believe that the 50% cut in geothermal research funding would be devastating to the ability of this program to help develop the technologies needed to tap our enormous geothermal resource.

The DOE geothermal energy research program has been seriously underfunded for years. DOE's own Strategic Plan calls for a near-term annual budget level of \$50 - \$60 million, but funding has ranged around a meager \$20 million. A \$50-\$60 million budget level would be consistent with recommendations made by the President's Committee of Advisors on Science and Technology (PCAST) in its 1997 report. Critical technical needs include the development of advanced drilling, exploration and reservoir sensing, energy conversion and metals recovery, and enhanced reclaimed water injection. (By comparison, Japan is spending \$150 million on geothermal energy research and development)

A recent independent review by the National Research Council, *Renewable Power Pathways*, generally agrees with this conclusion. The NRC panel states:

"In light of the significant advantages of geothermal energy as a resources for power generation, it may be undervalued in DOE's renewable energy portfolio. Significant amounts of high-grade resources are available, and geothermal power technologies can operate in a variety of duty cycles (from base load to peak load conditions).... In addition, the United States has taken the lead in successful commercial demonstrations of geothermal energy for generating electricity and heat at several sites and is the current technology leader in the world among very active competitors in Europe and Japan." (*Renewable Power Pathways*, page 53.)

While DOE's program has been undergoing fundamental change, we believe it is moving in a positive direction. In the past DOE's efforts have supported some important advances. For example, through the DOE geothermal research program:

- The National Renewable Energy Laboratory supported development of the "advanced direct contact condenser." This technology increases plant efficiency, expands power production and reduces environmental abatement requirements. It is operating at Unit 11 of The Geysers and is being applied elsewhere.
- Brookhaven National Laboratory substantially improved drilling cement, and as a result produced Thermoloc cement. This material was tested in cooperation with Unocal and Halliburton and is now in commercial use. It substantially extends the life of geothermal wells, reducing operating costs and improving power reliability.
- Sandia National Laboratory helped developed the rolling float meter, a drill rig device that measures the flow of drilling fluids to detect lost circulation quickly. This prevents the loss of fluids and their contamination. It was tested at drilling operations in the North Sea and is now used to reduce costs and improve drilling success rates around the world.
- A team of laboratory experts helped examined the pressure declines at The Geysers in California. Together with PG&E, Unocal, Calpine, and the Northern California Power Agency they developed and conducted new tests and produced enhanced computer modeling of the geothermal reservoir. That work underlies the effort to inject treated wastewater into The Geysers -- an activity that previously would have been technically dismissed. Data from this on-going project demonstrates that it is abating The Geysers pressure decline and will add roughly 150MW of power for California's energy needs.

The technology available today allows the use of geothermal resources for power or direct use energy in virtually every state West of the Mississippi. The potential energy from this resource is enormous, but we need to develop the technology that will allow us to use this energy economically. DOE and its laboratories have helped bring geothermal electricity to 40 million people worldwide, and support the technological lead of the U.S. geothermal industry.

We estimate that electricity production from many existing power plants could be improved through better technology and operational changes. Existing plants could provide perhaps 20-30% more power -- adding 500-600MW -- if there was a significant short-term investment in these improvements. Also, efforts to supply treated wastewater to The Geysers need to be continued on a priority basis to achieve projected increases in generating capacity.

In fairly short order, new geothermal capacity could be on-line in the West. A thousand megawatts or more of additional capacity lies in or immediately near existing facilities. New fields have been identified in several states involving thousands of megawatts more. It has been estimated that 5,000 MW of geothermal electricity could be developed in the West as fast as markets and permitting allow. This would be highly reliable, base load power.

Further, USGS has estimated that as much as 20,000 MW of additional geothermal electric power resources could be developed in the West. This level of development would presume sustained strong markets, or financial incentives like the production tax credit, and continued development of technology that DOE's research and development efforts support. Based upon our review of experts in the field, this level of power development may be possible over the next decade with appropriate federal and state support.

Of course, this is only electric power resource development. Today, there is also a significant direct use industry throughout the West that uses geothermal heat in schools, homes, farms, and industrial processes. Dr. John Lund of the Oregon Institute of Technology has estimated that an equal amount of energy could be harnessed through direct use applications in buildings, commercial operations and industrial processes. Of course, Dr. Lund also assumes that both federal and state governments continue to support expanded use of geothermal resources.

Combined, geothermal power and direct-use energy has enormous potential for the Western United States. Together, these estimates represent energy equivalent to roughly 20% of total current U.S. energy needs. And, with continued advances in technology, the contribution of geothermal energy can continue to expand far beyond this range. The ultimate potential energy contribution of geothermal resources is enormous -- thousands of times greater than the world's known oil reserves, for example.

Keys to achieving the potential of geothermal energy are: 1) extension of the production tax credit to new facilities and incremental capacity additions at existing power plants, 2) a strong DOE research and development program, and 3) priority processing by federal land management agencies of leases and permits for new geothermal development and expansions at existing facilities (consistent with the substantive requirements of the law).

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