Committee on Resources,

Subcommittee on Energy & Mineral Resources

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U.S. House of Representatives, Washington, D.C. 20515-6208 - - (202) 225-9297

Witness Statement

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Committee on Resources
Subcommittee on Energy and Mineral Resources
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Mr. Chairman and Members of the Subcommittee, I am Dr. Robert K. Dixon, Deputy Assistant Secretary, Office of Power Technologies, Energy Efficiency and Renewable Energy, U.S. Department of Energy. Thank you for the opportunity to testify on DOE=s role in supporting the use of one of the Nation=s most important renewable energy resources -- geothermal energy. Today I would like to provide information on the geothermal resources in the U.S., our geothermal research program and successes to date, and potential future efforts to capture the benefits presented by geothermal technology.

Let me start by saying that the Department of Energy fully appreciates the energy situation in the West and the impact it is having on ratepayers, taxpayers, power producers and energy suppliers across the region. The Office of Power Technologies has already begun providing technical assistance and support to the California Energy Commission in their efforts to identify and fund energy research for technology that can help relieve the energy supply shortfall in the future. We will continue to offer our assistance as appropriate to help move available technologies, including geothermal, into the Western energy grid.

Geothermal energy is currently providing power for almost 1.5 million homes, including 6% of the electricity needs of California and 10% of the needs of northern Nevada. This is clean energy which can be supplied to American consumers at stable prices for decades to come. Estimates of geothermal power potential vary widely, and work on improved estimates needs to be completed. According to an estimate by the Department=s Energy Information Administration(EIA, Geothermal Energy in the Western United States and Hawaii: Resources and Projected Electricity Generation and Supplies, September 1991), resources could provide over 40,000 MW of power in the West. This could amount to 20% of the region=s projected power generation demand. To capture this potential in states such as California, Idaho, Utah, Nevada and Arizona, the Geothermal Energy program implements a balanced research and development program to expand existing fields and reduce costs; reduce resource risks through an increased resource characterization effort; reduce the cost of drilling by developing advanced drilling technologies and through near-term technology development activities.

The DOE geothermal energy program has led the nation=s investment in geothermal research and development in partnership with the geothermal industry, researchers, and other agencies. As a result,

domestic geothermal power today, primarily in California and the western U.S., is producing highly reliable and clean power. The Department=s program has led the development of advanced geothermal technology to further the use of geothermal resources in electric power and direct uses of geothermal energy, providing heat and energy for schools, homes, and businesses. The benefits of DOE=s geothermal program in drilling research have also been shared with the oil and gas industry, enabling lower costs for well development.

Based on the research and development undertaken by the Department and its industry partners, almost 3000 MW of geothermal capacity is installed in the U.S. today, representing a capital investment of over $5 billion, or 0.35 percent of U. S. electricity produced in 1999. The DOE Geothermal Program already has realized a number of important successes. For example, the program supported the development of a high-performance cement (CaP) used to extend the lifetime of geothermal wells in harsh, hostile environments by a factor of twenty or more. Standard well cements severely deteriorate in geothermal environments after only one year, whereupon the damaged well must be repaired by re-drilling and re-cementing at an annual cost of about $150,000 per well. In comparison, there are no repair costs whatsoever projected over the twenty-year lifetimes of the estimated fifty geothermal wells that will be completed with CaP cement, saving more than $150,000,000. CaP cement is now commercially available from Halliburton under the trade name " ThermaLock Cement".

The DOE Geothermal Program has worked for several years with a geothermal developer, Oxbow Geothermal Inc. (now Caithness, Inc.), to field test new technology for characterizing Oxbow=s geothermal reservoir at Dixie Valley, Nevada. (Dixie Valley includes a 50 MW power plant serving the California market.) Through this joint effort, DOE researchers were able to test and verify the usefulness of several chemical tracers to establish the flow paths of injected water through the reservoir. The joint research led to the successful location of new injection wells to maintain pressure in the reservoir that should increase the reservoir=s lifetime significantly.

We have also had a major success in the development of synthetic diamond drill bits and have been honored as one of DOE's top 100 scientific and technological accomplishments during its first millennium (25 years) of existence. A conservative estimate places the total benefit derived from PDC (polycrystalline diamond compact) bit sales, regional economic impact, and cost savings for the drilling industry of almost $2 billion for the decade ending 1992. Another example is the Advanced Direct Contact Condenser which improved efficiency of flashed and dry steam power plants by as much as 5% and increased plant generating efficiency by over 15%.

Some of the nation=s geothermal resources have been identified and developed to some extent. Additional development is possible at these sites, and industry, with support from the Department=s Geothermal Program, is actively pursuing this course. However, analytical studies suggest that significant amounts of geothermal resources remain undiscovered, mostly in the Western states. To bring these Ahidden@ resources into production, a concerted effort is needed on several fronts, including improvements in exploration technology and exploratory drilling.

We estimate that only about 10 percent of geothermal resources have visible expression at the surface of the Earth. The challenge is to develop instruments and techniques that allow resource detection and characterization with minimal exploratory drilling. The Program is meeting this challenge with the development and testing of exploration tools and techniques adapted to geothermal conditions. For example, the Department, in conjunction with the California Energy Commission, is providing technical support to an industry partner in the design, fabrication, and testing of a new electromagnetic tool for exploratory wells. The tool will have the capability of scanning for geothermal resources at considerable distances from the

well.

Projects designed to locate new resources through cost-shared drilling of exploratory wells with industry partners comprise an important part of our program. Last fiscal year, we awarded seven grants, valued at $6.8 million, to industry partners for support of exploration and development of new or previously undiscovered geothermal resources in four western states. We consider this work to be among the highest priorities for our Program. In addition, the Program has recently been working with U.S.G.S. to explore possible areas of cooperation in assessing geothermal resources in the Great Basin.

A major issue associated with increasing the use of geothermal energy in the Western states is the use of public lands. The Department hosted a workshop in November 2000, through the National Renewable Energy Laboratory to discuss geothermal facility siting issues on Federal lands. This event was co-sponsored by the Geothermal Energy Association and the Idaho National Engineering and Environmental Laboratory. Participants included representatives of the geothermal industry, Federal agencies, including the DOE, the U.S. Bureau of Land Management, the U.S. Forest Service, the U.S. Fish and Wildlife Service, the U.S. Minerals Management Service, state agencies, and independent consultants.

The workshop was designed to further the discussion begun at an informal kick-off meeting in September 2000 at the Geothermal Resources Council Annual Meeting in San Francisco, CA. Participants in that meeting, which included geothermal industry and Federal officials, agreed that geothermal facility siting issues are critical to the expanded and timely use of geothermal energy in the U.S. They requested continuing discussion to better define these issues and to develop and recommend potential solutions.

As a result of this workshop, the Department of Energy is considering a high priority recommendation by the participants to establish, in cooperation with other Federal agencies and stakeholders a National Geothermal Coordinating Committee (NGCC), modeled after the National Wind Coordinating Committee. The NGCC would include broad representation of Federal and state agencies, the geothermal industry, and public interest groups on geothermal issues. The purpose would be to facilitate communication and coordination of information exchange among the parties. The NGCC would meet on a regular basis to consider national consensus actions to facilitate the use of geothermal resources. The NGCC would not be involved in agency decisions or in actions by individual agencies. A second recommendation made by the participants at the workshop was to expand efforts to understand the social impacts of geothermal siting, both on Federal and private lands.

The drilling of wells constitutes 30-50 percent of the total cost of a geothermal power project. Geothermal wells cost significantly more than oil and gas wells (on a per foot basis) due to the difficult drilling conditions found in geothermal environments. Our research goal is to decrease the cost of drilling geothermal wells by 50 percent with the development of a new geothermal advanced drilling system. This system will build on recent advances in oil and gas drilling and include innovations and adaptations particular to geothermal=s needs.

In addition to technical assistance, the Department of Energy geothermal program provides support at state and local levels to address issues impacting the development of geothermal power. Working in conjunction with the U.S. geothermal industry, power producers and suppliers, industrial and other major energy consumers, the Department=s Regional Offices and national laboratories provide technical support, guidance, information and cost-shared funding to regional, state and local agencies to explore and develop their geothermal energy resources. By highlighting the benefits of geothermal energy, our program is helping state and local communities become aware of the benefits and advantages of geothermal energy.

In this effort, we focus on a few strategic areas. One area is Federal energy management to increase the purchase and use of geothermal-generated electricity at facilities operated by the Federal government, the Nation=s largest single energy user. We also provide support for state-level activities to explore geothermal resources and benefits from development. Finally, we provide outreach and other support such as resource assessments, mapping, general information to help public officials, industry, and energy consumers to make informed decisions on energy generation and use.

In conclusion, DOE=s research programs have supported the development of advanced geothermal technology. However, more remains to be done to advance the technology and overcome existing barriers to development.

Thank you again for the opportunity to appear before the Subcommittee and I look forward to working with the Members to undertake a balanced effort to capture the benefits of our nation=s geothermal resources.

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