GEOTHERMAL RESOURCES ON PUBLIC LANDS

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND MINERAL RESOURCES

OF THE

COMMITTEE ON RESOURCES
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED SEVENTH CONGRESS

FIRST SESSION

May 3, 2001

Serial No. 107-23

Printed for the use of the Committee on Resources

Available via the World Wide Web: http://www.access.gpo.gov/congress/house
or
Committee address: http://resourcescommittee.house.gov

U.S. GOVERNMENT PRINTING OFFICE

72-134 PS WASHINGTON : 2001

For sale by the Superintendent of Documents, U.S. Government Printing Office
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OVERSIGHT HEARING ON GEOTHERMAL RESOURCES ON PUBLIC LANDS: THE RESOURCE BASE AND CONSTRAINTS ON DEVELOPMENT

Thursday, May 3, 2001
U.S. House of Representatives
Subcommittee on Energy and Mineral Resources
Committee on Resources
Washington, DC

The subcommittee met, pursuant to notice, at 10:26 a.m., in Room 1334, Longworth House Office Building, Hon. Barbara Cubin [Chairman of the Subcommittee] presiding.

STATEMENT OF THE HONORABLE BARBARA CUBIN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WYOMING

Mrs. CUBIN. The oversight hearing by the Subcommittee on Energy and Mineral Resources will please come to order.

The subcommittee is meeting today to hear testimony on "Geothermal Resources on Public Lands: The Resource Base, and Constraints on Development." Under Committee Rule 4(G), the Chairman and the Ranking Minority Member can make opening statements. If any other members have statements, they can be included in the hearing record under unanimous consent; although certainly, with so few members being here, if anyone wants to give an opening statement, we will take the time to do that.

This is the fifth subcommittee hearing on issues concerning energy supplies from our public lands. We have focused upon fossil fuels in previous hearings, but today our topic is the discussion of geothermal energy found on our public lands. We would like to explore the questions of: How much of this resource is geologically available to tap? How much may be economic to do so for electric generation or direct heat uses? What, if any, regulatory or statutory constraints are preventing such development?

The Geothermal Steam Act of 1970 authorizes the Secretary of the Interior to competitively lease public lands for geothermal energy development. As with oil, gas, and coal resources, this authority extends to the U.S. Forest Service administered lands as well, with the consent of the Department of Agriculture.

This Act requires the Secretary to levy a royalty of between 10 percent and 15 percent of the value of the geothermal resource, which is a higher rate than the typical onshore oil and gas lease.

Furthermore, when geothermal steam drives a turbine to make electricity, seldom is there an arm's-length sales market upon which to judge the value of the steam as it leaves the wellbore. Thus, a net-back approach to valuing the steam is necessary. Deductions for operating costs, transmission costs, and return on capital investment are factored in to determine royalty value of the steam.

Are these calculations fair? Does the royalty rate inhibit decisions to generate electricity from geothermal resources? Or, are other factors, such as capital costs and facility siting and permitting problems, more likely to cause the decision not to build a geothermal power plant or utilize geothermal energy in direct heat applications?

I want to thank all of our witnesses today for coming in to enlighten us as to the answers to these questions. Wyoming isn't known as a hotbed of geothermal energy, except for the geothermal features of Yellowstone National Park—which, of course, I do not advocate tapping for geothermal power. But I feel strongly that this resource cannot be overlooked where it does make sense economically to develop it.

I think it needs to be a part of the overall energy policy, the long-term energy policy that we want to develop to keep the United States more secure as a nation and to avoid the boom-and-bust cycle of energy that we go through.

So now I recognize the Ranking Member, Mr. Kind, for his opening statement.

[The prepared statement of Mrs. Cubin follows:]

Statement of The Honorable Barbara Cubin, Chairman, Subcommittee on Energy & Mineral Resources

This is the fifth Subcommittee hearing on issues concerning energy supplies from our public lands. We have focused upon fossil fuels in previous hearings, but today our topic is the discussion of geothermal energy found on our public lands. We would like to explore the questions of how much of this resource is geologically available to tap; how much may be economic to do so for electricity generation or direct heat uses; what, if any, regulatory or statutory constraints are preventing such development?

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Are these calculations fair? Does this royalty rate inhibit decisions to generate electricity from geothermal resources? Or are other factors, such as capital costs and facility siting and permitting problems, more likely to cause the decision to not build a geothermal power plant or utilize geothermal energy in direct heat applications?

I want to thank our witnesses for coming today to enlighten us as to these questions. Wyoming isn't known as a "hotbed" of geothermal energy, except for the thermal features of Yellowstone National Park, WHICH I DO NOT ADVOCATE TAPPING FOR ELECTRIC POWER !! But, I feel strongly that this resource should not be overlooked where it does makes economic sense to exploit it.

STATEMENT OF THE HONORABLE RON KIND, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WISCONSIN

Mr. KIND. Thank you, Madam Chair. I want to thank the witnesses for being here today. I am looking forward to your testimony. I am doing an educational bill markup right now, so I am going to have to take off in a moment. But I have reviewed your written statements that you submitted earlier, and appreciate your coming here.

I want to thank Madam Chair for allowing this hearing to go forward today. I raised the issue, it must have been about a month ago or so. And she accommodated the interests of many committee members by agreeing to hold this hearing. And I thank her for doing it.

I do have a written statement that I think I'll just submit, without objection, for the record at this time. But I think as we move forward, and as Vice President Cheney moves forward in particular, in reviewing long-term energy needs, trying to put together a comprehensive energy policy, that we should be interested in this Congress, in this nation, in looking at viable alternative and renewable energy sources in the mix of fossil fuels that are currently being explored for our long-term energy needs.

We are looking at the potential for geothermal power, the abundance, the availability, the clean energy source that it provides. I think a lot more can be done. I will be interested in hearing more from our panels of witnesses as far as why more isn't being done, and the feasibility of doing it.

I know we have problems with the permitting process. That was loud and clear in the written testimony that was submitted by many of you. I would like to work with you on that. But I think that we can be doing more in this area.

If we look at what some of the developing nations are doing around the world right now, it is kind of exciting seeing them go down this path. Kenya, for instance: There was a very interesting article in the "Christian Science Monitor" about a month and a half ago talking about Kenya's development of geothermal. Although it is only at 6 percent of the energy needs today, it is projected to be 25 percent by 2017.

The countries down in Central America, for instance: Four or five countries are relying on geothermal sources. Costa Rica, El Salvador, and Nicaragua are generating 10 to 20 percent of their electricity geothermally. The Philippines generates 22 percent from this source. So I think there is a tremendous untapped potential that still exists within this country in exploring the viability of geothermal power.

I did find it interesting; I do not know how many of you caught the article in the "Washington Post" today that Exxon took out, kind of talking about the drawbacks of alternative and renewable energy sources. What was missing in that article was any mention of geothermal. And that is my concern, and that is why I am appreciative of this hearing today; because geothermal seems to be the one that is always left out of the mix or out of any serious discussion when it comes to our energy needs.

And I will be curious to hear if any of you have been approached or contacted by the Cheney review team, in regards to the energy

strategy that they are trying to put in place right now, about the use of geothermal and how that can be a piece of the pie that we need to work on to deal with some of these short-term energy needs that we have as well.

On the West Coast, California is a prime example. And 25 percent of our geothermal production is occurring in California already. But I think there are other areas in the country. My area in southwestern Wisconsin, for instance, has been identified as a great potential for geothermal; the whole eastern part of the State of Iowa. And I know that we are just a week away from serious troubles with our energy supply in the Midwest.

So again, I thank the Chair for having this hearing. I thank the witnesses. I will try to stay as long as I can, and look forward to the testimony. Thank you.

Mrs. CUBIN. The Chair now recognizes Mr. Gibbons.

Mr. GIBBONS. Thank you, Madam Chairman.

Mrs. CUBIN. Asks unanimous consent to recognize Mr. Gibbons. Without objection.

STATEMENT OF THE HONORABLE JIM GIBBONS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEVADA

Mr. GIBBONS. Stunned. Stunned at the response there, Madam Chairman. I, Madam Chairman, want to thank you for having this hearing. I think it is a very timely and important part of this nation's future, to look at our energy policies and to come up with some sound solutions. And I certainly want to thank the witnesses who are here as well to help us better understand this issue.

As we look at alternative energy sources, certainly there are those that have a large footprint and small benefit. Many times, I have driven down through California and looked at the wind production fields that are out there—massive areas, acre after acre, of these huge windmills which have a visual implication as well. And considering geothermal and its alternative to the solar-wind-geothermal mix, geothermal in my view has a much smaller footprint with a much larger benefit. Because unlike solar and wind, geothermal energy has a more durable production capability—a better source, if you will. Whenever the sun goes down, of course, we cannot depend on solar. Whenever the wind dies down, you cannot depend upon the wind energy. But geothermal is an energy source that remains regardless of the surface conditions.

I think one of the issues that we have to address in this nation as we go forward is the competing demand for alternative energy in competition with the competing demands, or locking up vast areas of this nation which do have a productive field of geothermal energy potential. Those conflicts are going to have to be viewed and looked at and discussed. And certainly, I hope this panel will be able to answer a few questions as we move down this hearing with regard to the competing demands for locking up public land, locking out energy potential, with regard to the new demands that we are seeing today made on our energy production.

With that, Madam Chairman, I want to say again thank you, and the witnesses that will be here today with regard to this hearing.

Mrs. CUBIN. Thank you, Mr. Gibbons.

Now I would like to recognize the first panel of witnesses, and thank them very much for being here: Dr. Colin F. Williams, supervisory geophysicist for the U.S. Geological Survey; Dr. Robert K. Dixon, Deputy Assistant Secretary of the Office of Power Technologies, U.S. Department of Energy; Mr. Bob Anderson, Deputy Assistant Director for Minerals, Realty and Resource Protection, U.S. Bureau of Land Management; who is accompanied by Mr. Harold Corley, geologist with the U.S. Minerals Management Service.

Thank all of you for being here. And now the Chair recognizes Mr. Williams to testify for 5 minutes. The timing lights on the table will indicate when your time has concluded. All witnesses' entire statements will be submitted in the record. So, Mr. Williams—or Dr. Williams, excuse me.

STATEMENT OF COLIN F. WILLIAMS, SUPERVISORY GEOPHYSICIST, U.S. GEOLOGICAL SURVEY

Dr. WILLIAMS. Thank you. Madam Chairman and distinguished members of the subcommittee, thank you for this opportunity to present on behalf of the U.S. Geological Survey this statement regarding our assessment of the location, extent, and nature of geothermal resources in the United States.

The Geothermal Energy Research, Development and Demonstration Act of 1974 assigned responsibility for the evaluation and assessment of geothermal resources to the USGS through the Department of the Interior. The efforts under this Act led to the publication of two comprehensive national assessments; the last being USGS Circular 790, "Assessment of Geothermal Resources of the United States - 1978."

In this statement I will summarize the current state of geothermal energy in the United States, and provide information on the evolution of geothermal science and technology as it relates to the resource assessments of the 1970's. I will concentrate on the nature and abundance of geothermal systems suitable for electricity power generation.

Geothermal reservoirs are classified according to their temperature and whether the reservoir fluid occurs as liquid water or as steam. Geothermal power is obtained from steam produced directly from the ground, from steam flashed and separated from hot water, and from binary power plants using closed-loop heat exchange between hot water and fluids with low boiling temperatures.

Today the United States has an installed capacity of approximately 2,860 megawatts of electric power production from geothermal plants located in California, Hawaii, Nevada, and Utah. This constitutes one of the nation's largest sources of non-hydroelectric renewable electrical power.

The comparison of the findings of Circular 790 with the current state of development highlights some important points. Circular 790 identified nine Western states—Alaska, Arizona, California, Hawaii, Idaho, Nevada, New Mexico, Oregon, and Utah—with the potential for at least 100 megawatts of electrical power generation per state from identified geothermal systems.

The total high temperature geothermal resources from identified systems in these nine states was estimated at approximately

22,000 megawatts. Only California has realized a significant fraction of this potential, with development of approximately 2,600 out of 12,000 megawatts. Estimates of the electric power potential of undiscovered resources ranged from 72,000 to 127,000 megawatts.

The Great Basin region, which encompasses parts of Nevada, Utah, California, Oregon, and Idaho, has the lowest percentage of developed power with respect to the Circular 790 estimates. Only about 500 megawatts are produced in the Great Basin, compared with an estimated high-temperature resource of about 7,500 megawatts.

A critical question is the extent to which these estimated geothermal resources can be developed. The possible reasons for the large difference between the estimated resource and installed capacity are varied. Among the factors limiting geothermal resource development are the following:

Economics—Until recently, the 5- to 8-cents per kilowatt-hour cost of geothermal energy was not competitive with fossil fuel generated power.

Water—Reservoirs exploited with flash-steam power plants lose water from their cooling towers. In many Western states the water for reinjection into geothermal reservoirs is in short supply.

Remote Locations—Many geothermal systems, particularly those in the Great Basin, are dispersed in relatively remote locations with limited access to the power transmission lines and other facilities.

Also, because geothermal reservoir development requires drilling, it has often proven difficult for power companies to obtain financing in the absence of up to date resource information.

Finally, there are uncertainties in the Circular 790 assessment. The state of knowledge about geothermal resources has advanced dramatically in the past 20 years, and estimates of the high-temperature resources could change with a new examination.

There are also reasons why some of the estimates contained in Circular 790 could be realized:

One is binary power plants. The maturation of binary power plant technology has provided a means of exploiting geothermal reservoirs with little or no loss of water.

There are also sources of reclaimed water. Effluent pipelines carrying reclaimed water from urban areas have become a cost-effective and environmentally sound means of providing water for reinjection into depleted geothermal reservoirs.

There are Enhanced Geothermal Systems. With Department of Energy support, scientists and engineers have been developing a reservoir stimulation technique known as "Enhanced Geothermal Systems." Through the use of this technique, companies will be able to increase the capacity and extend the lifetime of geothermal fields.

Finally, there is improved exploration technology, which is allowing companies to better predict productivity of a specific resource.

Recent assessments have led to widely varying results regarding the total power potential. Estimates of potential power projection of geothermal resources range from 6,300 to 27,000 megawatts, depending on assumptions regarding the extent of the resource and the impact of new technology.

Along with the need to reduce uncertainties in the assessment of domestic geothermal resources, there are many research efforts which could benefit geothermal power in the near term. Among these are exploration and drilling technology; more work in Enhanced Geothermal Systems; and further work in integrated geological studies.

Madam Chairman, that concludes my remarks, and I would be happy to answer any questions the committee may have.

[The prepared statement of Dr. Colin F. Williams follows:]

Statement of Dr. Colin F. Williams, Supervisory Geophysicist, U.S. Geological Survey, Department of the Interior

Madam Chairman and distinguished Members of the Subcommittee, thank you for this opportunity to present, on behalf of the U.S. Geological Survey, this statement regarding our assessment of the location, extent and nature of geothermal resources in the United States.

BACKGROUND

The Geothermal Energy Research, Development and Demonstration Act of 1974 (P.L. 93–410) assigned responsibility for the evaluation and assessment of geothermal resources to the USGS through the U.S. Department of the Interior (DOI). The assessment efforts initiated under this Act led to the publication of USGS Circular 726, Assessment of Geothermal Resources of the United States - 1975 and USGS Circular 790, Assessment of Geothermal Resources of the United States - 1978. These reports established the methodology for geothermal resource assessments and provided estimates of potential electric power generation that have guided geothermal energy research and development for the past 22 years.

In this statement I will summarize the current state of geothermal energy in the United States and provide information on the evolution of geothermal science and technology as it relates to the resource assessments of the 1970s.

THE CURRENT STATE

Today, the United States has an installed capacity of approximately 2,860 Megawatts (MW) of electrical power production from geothermal plants located in California, Hawaii, Nevada, and Utah. This constitutes 0.4% of our total electricity generation capacity and is the Nation's largest source of non-hydroelectric renewable electrical power.

CLASSIFICATION, LOCATION AND DEVELOPMENT OF GEOTHERMAL RESOURCES

The Earth's internal heat drives many geologic processes and, where it is locally concentrated, this heat can be manifested as volcanoes, hot springs, and other thermal features. Large portions of the western U.S. are characterized by abnormally high heat flow as a result of active faulting and volcanism. All of the existing geothermal power plants fall within these regions. The Earth's heat can be exploited at various temperatures to provide a source of geothermal energy.

Geothermal reservoirs are classified according to their temperature and whether the reservoir fluid occurs as liquid water or as steam. Geothermal power is obtained from steam produced directly from the ground, from steam flashed and separated from hot water, or from binary systems involving closed-loop heat exchange between hot water and organic fluids with low boiling temperatures.

High temperature geothermal systems have temperatures greater than 150 oC (302 oF) with the reservoir fluid comprising hot water and/or steam. These systems are typically the best candidates for electricity generation and power plants exploiting these systems typically flash the hot water to drive steam turbines.

Intermediate temperature systems have temperatures between 90 and 150 oC (194 and 302 oF) and generally require the use of binary power plants with closed-loop heat exchange technology that allows transfer of the heat in the geothermal fluid to a second fluid that vaporizes at lower temperature.

Low temperature systems are those with temperatures less than 90 oC (194 oF) and are generally considered appropriate for direct use applications (space heating, agricultural process heat, spas). In this statement I will concentrate on the nature and abundance of intermediate and high temperature geothermal systems in the United States. A general overview of all aspects of geothermal energy can be found in USGS Circular 1125, Tapping the Earth's Natural Heat.

The last nationwide geothermal resource assessment (USGS Circular 790) was published in 1978, and a comparison of its findings with the current state of knowledge and development highlights some important points.

- Circular 790 identified nine western states (Alaska, Arizona, California, Hawaii, Idaho, Nevada, New Mexico, Oregon and Utah) with the potential for at least 100 MW of electrical power generation per state from identified geothermal systems.
- The total identified high temperature geothermal resource in these nine states was estimated at approximately 22,000 MW. On a state-by-state basis, only California has realized a significant fraction (22%) of this potential (2,600 out of 12,000 MW). Estimates of undiscovered resources ranged from 72,000 to 127,000 MW.
- The Great Basin region, which lies mostly in Nevada and Utah but also encompasses parts of California, Oregon, and Idaho, has the lowest percentage of developed power with respect to the Circular 790 estimates. Only about 500 MW are produced in the Great Basin compared with an estimated high-temperature resource of about 7,500 MW.

The following table summarizes the results of the state-by-state comparison for the nine states highlighted in the 1978 resource assessment and the installed electrical power generating capacity as of 1998 (Source - Energy Information Administration (EIA)—Department of Energy).

State.	Estimated Geothermal Resource -1978 (MW)	Installed Capacity -Geothermal (MW)	Installed Capacity -All Sources (MW)	Percentage of Geothermal Power
Alaska	250	0	2093	0
Arizona	1,000	0	15,254	0
California	12,000	2,600	52,349	4.9%
Hawaii	250	30	2,353	1.3%
Idaho	540	0	3,001	0
Nevada	2,000	200	6,389	3.1%
New Mexico	2,700	0	5,531	0
Oregon	2,200	0	11,344	0
Utah	1,350	33	5,206	0.6%
TOTAL	22,290	2,863	103,520	2.8%

If the entire estimated resource for these nine states could be exploited as electrical power, it would equal 21.5% of the electrical power generated from all other sources. The possible reasons for the large difference between the estimated geothermal resource and installed capacity are varied and, in the absence of another systematic resource assessment, difficult to quantify.

Among the factors limiting geothermal resource development are the following.

- Economics—Until recently, the 5- to 8-cent per kilowatt-hour (kwh) cost of geothermal energy was not competitive with fossil fuel-generated power costing as little as 3 cents/kwh.
- Water—Reservoirs exploited with flash-steam power plants lose a significant fraction of the produced water from their cooling towers. In many western states water for reinjection into geothermal reservoirs is either unavailable or in short supply.
- Remote Locations—Many geothermal systems, particularly those in the Great Basin, are dispersed in relatively remote locations with limited access to electric power transmission lines and other facilities.
- Validation of the Resource—Because geothermal reservoir development requires drilling, it has often proven difficult for power companies to obtain financing in the absence of up to date resource assessments.
- Uncertainties in the Circular 790 Assessment—The state of knowledge about geothermal resources has advanced dramatically in the past 20 years, and there is evidence that Circular 790 may have overstated the abundance of undiscovered high temperature resources in the western U.S.

There are also a number of technical reasons why geothermal resource development could approximate some of the estimates contained in Circular 790.

- Binary Power Plants - The maturation of binary power plant technology has provided a means of exploiting geothermal reservoirs with little or no loss of water. In addition, binary power plants have enabled the development of intermediate temperature systems not included in the Circular 790 estimate.
- Reclaimed Water—Effluent pipelines carrying reclaimed water from urban areas have become a cost-effective and environmentally sound means of providing water for reinjection into declining or depleted geothermal reservoirs. For example, reclaimed water is now being used to replenish The Geysers geothermal field in California, which produces approximately 1,200 MW of electricity.
- Enhanced Geothermal Systems—With DOE support, scientists and engineers have been developing a geothermal reservoir stimulation technique known as Enhanced Geothermal Systems (EGS). Through the hydraulic fracturing of the hot but impermeable rock surrounding geothermal reservoirs, power companies will be able to increase the amount of hot rock available to heat geothermal fluid, increasing the capacity and extending the lifetime of existing geothermal systems.
- Exploration Technology—Improved geochemical and geophysical tools for geothermal exploration, together with targeted test drilling, have allowed power companies to more accurately predict the productivity of a specific geothermal resource before embarking on an expensive program of production drilling.

Recent efforts to incorporate some or all of these developments in updated assessments have led to widely varying results. According to a 1999 report prepared by the Geothermal Energy Association (GEA) and the DOE (Geothermal Energy, The Potential for Clean Power from the Earth), the domestic geothermal energy potential ranges from 6,520 MW with existing technology to 18,880 MW with enhanced technology. A geothermal industry consultant's re-examination of the Circular 790 assessment with the addition of potential Enhanced Geothermal System sources gives a range of values between 6,300 and 27,400 MW (J. Sass, unpublished report). The Strategic Plan for the DOE Office of Power Technologies has a goal for geothermal energy to provide 10% of the electric power requirements of western states by the year 2020. This would require more than 10,000 MW of additional geothermal power, and a review by the National Research Council (NRC) suggests this goal is unlikely to be met (Renewable Power Pathways: A Review of the U.S. Department of Energy's Renewable Energy Programs, NRC, 2000). By contrast, the Energy Information Administration of DOE estimates an installed geothermal power capacity of 4,140 MW by 2011 (EIA Annual Energy Outlook 2001 - http://www.eia.doe.gov/oiaf/aeo/aeotab—17.htm).

Future Directions for Research and Development

Along with the need to reduce the uncertainties in the assessment of domestic geothermal resources, there are many active research efforts in geothermal science and technology that could benefit the geothermal power industry in the near term.

- Exploration and Drilling - Although the technology of power generation is well advanced, new geothermal systems can be hard to locate and expensive to develop. Advances in exploration and drilling technology can cut costs and increase the probability of success.
- Enhanced Geothermal Systems - Techniques for expanding and sustaining geothermal reservoirs are in their infancy, and EGS experiments proposed for the next few years could greatly expand the existing resource base.
- Integrated Geological Studies - In order to accurately assess the geothermal resources of the western U.S., significant progress needs to be made on understanding the processes responsible for the formation of geothermal systems, particularly in the Great Basin. Recent investigations of the interrelationships among heat flow, ground-water circulation, active faulting, volcanism, and geochemical fluid-rock interactions suggest that the Earth Science community is on the verge of developing a new, comprehensive understanding of geothermal systems. The resulting models for the nature and extent of geothermal systems would not only improve the accuracy of any new assessment but also enable the development of more economical exploration and development strategies for geothermal energy.

Madam Chairman, this concludes my remarks. I would be happy to respond to questions Members of the Committee may have.

Mrs. CUBIN. Thank you, Dr. Williams. Right on time. That was like a deejay.

[Laughter.]

Mrs. CUBIN. The Chair now recognizes Dr. Dixon to testify.

STATEMENT OF ROBERT K. DIXON, DEPUTY ASSISTANT SECRETARY, OFFICE OF POWER TECHNOLOGIES, U.S. DEPARTMENT OF ENERGY

Dr. DIXON. Madam Chairman and members of the subcommittee, good morning. And thank you for the invitation to appear before you today. I have offered written testimony for the record. I am also going to refer to some graphics which have been handed out to each of you.

I am Dr. Robert Dixon. I serve as Deputy Assistant Secretary at the Department of Energy.

The President recently called the electricity crunch a national energy crisis. If the worst-case electricity shortages occur, up to two-thirds of the 125 million American electricity users could be affected. Americans need new sources of power and heat. The new national energy plan, which is being developed under the leadership of Vice President Cheney, is expected to be released in about 2 weeks, and will contain important guidance for the future directions and priorities of our programs, including geothermal energy. We are engaged in this process.

Investment in technologies such as geothermal can well reduce our dependence on imported energy sources, address the critical need for expanded energy supply, and help upgrade the energy infrastructure in the electric power sector.

Today I would like to share information with you regarding the Department of Energy geothermal research and development program. I will also report on our efforts to capture the benefits of geothermal resources.

Madam Chairman, the United States has an abundant geothermal resource, and this is a renewable energy resource. The hottest rocks and fluids are found closest to the surface in the Western U.S. Geothermal energy has a number of uses, including the generation of baseload and distributed electricity; provide process heat

for use in greenhouses and crop drying; direct heating and cooling of homes and commercial buildings. In addition, the dissolved minerals found in some geothermal fluids can be extracted for economic uses.

As you can see from the map, Nevada can be considered the center of the geothermal bull's-eye in the Western U.S. But as the chart indicates, California has been the historic leader in the development of geothermal resources. The U.S. installed capacity of geothermal energy is approximately 2,800 megawatts, with California, Nevada, Utah, and Hawaii the leaders. We understand that Hawaii plans to double their capacity in the near future.

The Department believes that considerable resource development remains to be done in the Western U.S., in the States of Alaska, Arizona, Colorado, Idaho, Montana, New Mexico, Oregon, Washington, and Wyoming.

Madam Chairman, considerable benefits from geothermal development have accrued since power generation began just over 40 years ago with The Geysers Geothermal Complex in northern California. The current benefits include electricity for over 1.5 million American homes across the Western U.S. That is 6 percent of California's electricity needs. That is 10 percent of the power needs in northern Nevada. Over $5 billion has been invested in plants. These plants are at over 90 percent capacity factor, and they have accrued over $20 million in royalties to the Federal Government.

The future potential benefits are quite large. We estimate that up to 20 percent of the Western power needs may be realized through geothermal energy if the nation were to achieve 40,000 megawatts of development over the next 20 to 30 years. We estimate the cumulative royalties resulting from this development would total about $3 billion. Capital investment, employment, and overall economic growth generated by large-scale geothermal development may represent as much as $60 billion. Mineral extraction is also a co-benefit, which will yield significant economic benefit.

Madam Chairman, the Department has a four-prong strategy for enabling geothermal energy development. First, we are involved in expanding existing fields through the application of more efficient, cost-effective technologies, such as improving the advanced surface equipment.

Secondly, we are engaged in efforts to reduce the risk of developing geothermal resources through an intensive effort of resource characterization. The U.S. Geological Survey, whose mission includes resource assessment, is our partner in this effort.

Third, we are working to reduce the cost of geothermal energy with new technology for drilling wells that will allow us to drill more wells more deeply and more cheaply than ever before.

And finally, we are looking to move beyond current technology which is based on producing hot fluids from water-saturated fractured-rock reservoirs. We hope to take advantage of the tremendous quantities of hot but water-deficient rocks lying close to the surface. We hope to develop the next generation of geothermal technology, termed "enhanced geothermal systems," that will allow us to create engineered reservoirs independent of naturally occurring ones.

Madam Chairman, up to this point I have addressed technological issues related to geothermal development. But recognizing that 75 percent of geothermal resources occur in public lands, institutional issues also merit our attention. To encourage further discussion on this issue, we have organized several workshops, and institutional barriers have been identified by our stakeholders which are an impediment to development of geothermal resources.

These impediments include permitting and siting activities; geothermal resource data sharing; lack of technical assistance and outreach; lack of access to electricity lines; and lack of a forum for information exchange on barriers to development.

Consequently, we are proposing or contemplating the organization of a group called the "National Geothermal Coordinating Committee," which will include any organization which has an interest in this activity.

Madam Chairman, I conclude my testimony today by identifying four areas for priority action and energy development. First, we need to expand more fields. Second, we need to continue to identify the new resources. We need to better understand the economics of geothermal energy. And most importantly, we need to continue to address the use of public lands for geothermal development.

Madam Chairman, thank you very much.

[The prepared statement of Dr. Robert K. Dixon follows:]

Statement of Dr. Robert K. Dixon, Deputy Assistant Secretary for Power Technologies, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy

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, pri-

marily 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 "hidden" 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.

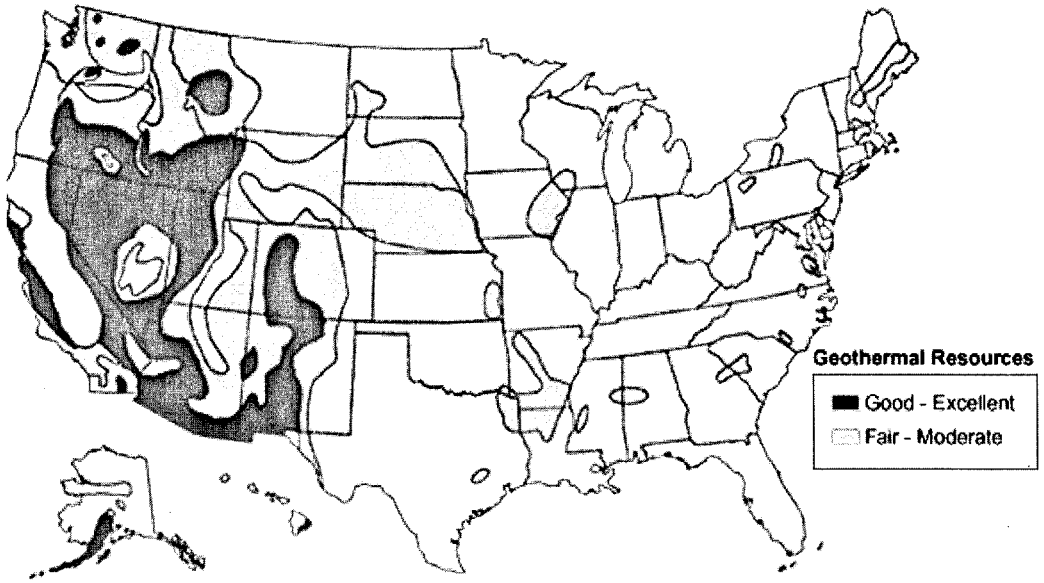
In this effort, we focus on a few strategic areas. One area is Federal energy management to increase the purchase and use of geothermal-generated electricity at facilities operated by the Federal government, the Nation's largest single energy user. We also provide support for state-level activities to 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.

[Additional material submitted for the record by Mr. Dixon follows:]

Geothermal Resources in the United States



Department of Energy
Washington, DC 20585

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July 23, 2001

The Honorable Barbara Cubin
Chairwoman
Subcommittee on Energy and Mineral Resources
Committee on Resources
U.S. House of Representatives
Washington, DC 20515

Dear Chairwoman Cubin:

On May 3, 2001, Robert K. Dixon, Deputy Assistant Secretary for Power Technologies, Office of Energy Efficiency and Renewable Energy, testified regarding an oversight hearing on "Geothermal Resources on Public Lands: The Resource Base and Constraints on Development."

Enclosed are the answers to two questions requested by Representative Napolitano to complete the hearing record.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Lillian Owen, at (202) 586-2031.

Sincerely,

Michael Whatley
Director, Office of Congressional
and Intergovernmental Affairs

Enclosures

Printed with soy ink on recycled paper

QUESTION FROM REPRESENTATIVE NAPOLITANO

Santa Rosa Project and Enhanced Geothermal Systems

Q1. The hearing acknowledged the need to develop water injection for geothermal resources that lack water to transfer their full heat potential. This technology is currently needed to address different heat and corrosion reservoir conditions within The Geysers and will eventually be needed at other reservoirs. Besides funding for the Lake County project and a small amount of initial funding for the Santa Rosa project, what research and development has the Department funded on water injection? Why has the Enhanced geothermal Systems activity been eliminated from the proposed 2002 budget?

A1. The Department considers injection as an essential element of a successful geothermal project. The injection of water, including the used brines from geothermal reservoirs. helps maintain the productivity of the reservoir and prolong its lifetime. We have conducted broad-ranging research related to injection which included improvements to reservoir simulators and the use of tracers that can be used to locate injection wells for proper reservoir management. In particular, we worked with the developer of the Dixie Valley (NV) geothermal resource to gain a much improved understanding of how fluids move through the reservoir from injection wells to production wells. The developer has used that information to implement an injection program that includes augmenting used brines with water from a shallow aquifer. Our work on injection has already improved the productivity of the geothermal fields at The Geysers and Dixie Valley and promises to have positive impacts at many other fields as well.

In concluding our efforts in Enhanced Geothermal Systems, the Department is placing higher priority on other activities within the Geothermal Program that have been identified by industry as critical for overcoming the chief technical barriers to greater near-term use of geothermal energy. These activities include developing technologies for finding and characterizing geothermal resources and reducing the cost of drilling wells.

QUESTION FROM REPRESENTATIVE NAPOLITANO

Santa Rosa Project

Q2. The Department has an opportunity to help fund much needed baseload energy in California. Can the Department contribute to recharging The Geysers by assisting in supplying reclaimed water from Santa Rosa?

A2. In the past, the Department supported a feasibility study of the geothermal pipeline alternative that led to the selection of this wastewater disposal option by the City of Santa Rosa. The Department has also worked closely with the geothermal industry in a research program to understand the drop in reservoir pressure and productivity at The Geysers. This research figured prominently in the subsequent success of the Lake County pipeline project. At this stage, we view the Santa Rosa Geysers Recharge Project as a public works water project rather than a research and development effort. We believe the City of Santa Rosa and the geothermal industry are fully capable of successfully developing the project without further assistance from the Department of Energy.

Mrs. CUBIN. Thank you very much, Dr. Dixon.

The Chair now recognizes Mr. Anderson.

STATEMENT OF BOB ANDERSON, DEPUTY ASSISTANT DIRECTOR, MINERALS, REALTY AND RESOURCE PROTECTION, U.S. BUREAU OF LAND MANAGEMENT; ACCOMPANIED BY HAROLD CORLEY, GEOLOGIST, U.S. MINERALS MANAGEMENT SERVICE

Mr. ANDERSON. Madam Chairman and members of the committee, I appreciate the opportunity to be here today to discuss the Bureau of Land Management's (BLM) geothermal leasing program. I am accompanied by Harry Corley, a geologist with the Minerals Management Service. Mr. Corley is an expert on royalty calculation and collection, and is available to answer questions.

The BLM, under the Geothermal Steam Act of 1970, is responsible for leasing Federal lands and reviewing permit applications for geothermal development. This authority encompasses about 570 million acres of BLM land, National Forest System lands, and other Federal lands, as well as private lands where the mineral rights have been retained by the Federal Government.

Much of the geothermal activity on Federal lands takes place in California and Nevada. California has 83 leases, 23 of which are producing; while Nevada has 126 leases, 27 of which are producing. More than 80 percent of the electrical generation from Federal geothermal resources occurs in California. Other states with geothermal activity include Utah, New Mexico, Oregon, and Washington.

The BLM's geothermal program has 54 producing leases, with an associated 29 power plants. These plants have a total capacity of 1,250 megawatts, and supply the needs of 1.2 million homes. Annual electricity sales from these plants exceeds $400 million.

The BLM places a priority on completing leasing and permit applications in a timely manner. Leasing issues we are facing include whether land use planning documents adequately address environmental, cultural, and specific plant and animal concerns.

Many of our land use plans have matured, and revisions must be made. We are streamlining the review process to address pending lease applications, and working to improve our coordination with federal, state, and county agencies. Due to energy demands and industry expectations for new power plant projects located on Federal lands, we expect to receive an increase in both geothermal development and right-of-way applications.

Recently, increased interest in geothermal development has occurred in Nevada. Since the beginning of 2001, Nevada BLM has received 44 non-competitive lease applications totalling about 100,000 acres. The geothermal industry has also requested BLM Nevada to conduct a competitive lease sale by this summer. The non-competitive applications and lease sale will nearly double the acres already leased in Nevada. Operators have stated publicly that they expect to develop 200 to 500 megawatts of new generation capacity over the next two to 5 years.

Public lands are available for leasing only after they have been evaluated through BLM's multiple-use planning process. Federal lands located in a known geothermal resource area are leased com-

petitively, and any Federal lands not located within these areas are leased non-competitively.

A lease may be no larger than 2,560 acres, and they are issued for 10 years. As long as commercial quantities of geothermal resources exist, the leases may be extended for up to 80 years. The BLM currently manages 139 competitive leases, and 148 non-competitive leases.

The Federal Government charges a royalty on geothermal production that is between 10 to 15 percent on the amount or value of the heat or energy produced on the lease. Most leases are at the 10 percent royalty rate. Federal revenues are disbursed according to the following Reclamation Act formula: 50 percent back to the state government in which the lease is located; 40 percent to the Reclamation Fund; and the remaining 10 percent to the United States General Fund.

Just to give you a comparison of revenues collected in the last 4 years, in 1997 we had about $26 million collected from royalties; in 1998, $18 million; dropping down to $10 million in 1999; and back up to $16 million in 2000.

In most cases, Federal royalties track the value of electricity, which is normally the end product of geothermal production. Price differences explain the fluctuations in year-to-year revenue collection.

Madam Chairman, this is just a brief summary of BLM's geothermal leasing program. I would be pleased to answer your questions.

[The prepared statement of Mr. Bob Anderson follows:]

Statement of Bob Anderson, Deputy Assistant Director, Minerals, Realty & Resource Protection, Bureau of Land Management, U.S. Department of the Interior

Madame Chairman and members of the Committee, I appreciate the opportunity to appear here today to discuss the Bureau of Land Management's (BLM) geothermal leasing program. I am accompanied by Harry Corley, a geologist with the Minerals Management Service (MMS).

The BLM, pursuant to the Geothermal Steam Act of 1970, as amended, is responsible for leasing Federal lands and reviewing permit applications for geothermal development. This authority encompasses about 570 million acres of BLM land, National Forest System lands (with concurrence of the Forest Service), and other Federal lands, as well as private lands where the mineral rights have been retained by the Federal Government.

Geothermal energy is heat derived from the earth. It is the thermal energy contained in the rock and fluid that fills the fractures and pores within the rock in the earth's crust. Geothermal resources, in reservoirs of steam or hot water, are available in several western states, Alaska, and Hawaii. The highest temperature resources are generally used only for electric power generation. Low and moderate temperature geothermal resources are used for heating of buildings, industrial processes, greenhouses, and aquaculture.

BLM S GEOTHERMAL PROGRAM

Much of the geothermal activity on Federal lands takes place in California and Nevada. California has 83 leases, 23 of which are producing, while Nevada has 126 leases, 27 of which are producing. More than 80% of the electrical generation from Federal geothermal resources occurs in California. Other states with geothermal activity include Utah, New Mexico and Oregon. The BLM's geothermal program has 51 producing leases. The BLM administers the 29 power plants using Federal resources in California, Utah and Nevada. The plants have a total capacity of 1250 MWs, and supply the needs of 1.2 million homes. Annual electricity sales from these plants exceed $400 million.

The BLM places a priority on completing leasing and permit applications expeditiously. Leasing issues we are facing include whether planning documents ade-

quately address developing environmental, cultural, and specific plant and animal concerns. We are streamlining the review process to address pending lease applications and working to improve coordination with cooperating Federal, State, and county agencies. Due to industry expectations for new power plant projects located on Federal lands, we expect to receive a dramatic increase in both permit and right-of-way applications

Recently, increased interest in geothermal development has occurred in Nevada. Nevada's population growth and regional energy demands are stimulating a rapid increase in interest to develop geothermal resources for electrical generation. Since the beginning of 2001, Nevada BLM has received 44 noncompetitive lease applications totaling approximately 100,000 acres. The geothermal industry has also requested BLM Nevada conduct a competitive lease sale by this summer. The noncompetitive applications and the lease sale will nearly double acres leased in Nevada. Operators have stated publicly that they expect to develop 200 to 500 megawatts of new generation capacity over the next two to five years. The President's fiscal year 2002 budget request provides the BLM with an additional $50,000 to process geothermal lease applications and the increase in the number of permit applications in Nevada. BLM Nevada is also reassigning staff and program resources to address the increasing workload.

LEASING

Public lands are available for leasing only after they have been evaluated through BLM's multiple-use planning process (National Environmental Policy Act, NEPA, and Federal Land Policy and Management Act, FLPMA). Stipulations may be placed on leases to protect other resources through mitigation or restrictions on surface use. For example, geothermal leasing is not allowed on lands within National Parks, wilderness areas, wilderness study areas, or National Recreation Areas. There are two processes for leasing geothermal resources—competitive and non-competitive.

Federal lands located in a Known Geothermal Resource Area (KGRA) are leased competitively, and any Federal lands not located in KGRAs are leased noncompetitively. BLM designates KGRA based on: a) geologic and technical evidence, b) proximity to wells capable of production in commercial quantities, and c) existence of competitive interest. BLM currently has 48 designated KGRAs. They are located in California, Nevada, Oregon, Utah and New Mexico. A lease may be no larger than 2,560 acres. Leases are issued for 10 years. As long as commercial quantities of geothermal resources exist, the leases may be extended for up to 40 years. The BLM currently manages 139 competitive leases (totaling 174,000 acres) and 148 non-competitive leases (totaling 173,000 acres).

Federal lands located in a KGRA are leased through a competitive sale using sealed bids. BLM state offices determine how often to conduct competitive sales. Prior to a sale, the BLM makes a Determination of NEPA Adequacy (DNA) assuring that the requirements of NEPA, the Endangered Species Act, and cultural resource policies are satisfactorily addressed. Those lands that have been cleared for leasing are parceled, and stipulations prepared, and published in a Notice of Competitive Geothermal Lease Sale. BLM establishes a minimum acceptable bid for each parcel, but this information is not disclosed to the public. All bids are opened, and the highest bid meeting or exceeding the minimum acceptable bid is awarded the lease.

An applicant may file noncompetitive lease offers for any Federal lands not located in a KGRA. The BLM state and field offices review the lands receiving offers for availability and prepare DNAs. Stipulations are prepared for those lands that have been cleared for leasing.

FEDERAL REVENUES

The Federal Government charges a royalty on geothermal production that is between 10% to 15% on the amount or value of the heat or energy produced on the lease. Most leases are at the 10% royalty rate. Federal revenues are disbursed according to the following Reclamation Act formula: 50% to the State in which the lease is located; 40% to the Reclamation Fund; and the remaining 10% to the United States General Fund.

The following table displays the geothermal revenues collected in the past 4 calendar years.

(In millions)	1997	1998	1999	2000
California	$ 20.3	$ 13.8	$ 8.9	$ 14.3
Nevada	5.3	4.3	0.9	1.5
Utah	0.2	0.2	0.2	0.2
Total	$ 25.8	$ 18.3	$ 10.0	$ 16.0

Note: New Mexico revenues not listed because they are less than $1,000 per year. The leases in Oregon are not producing.

In most cases, Federal royalties track the value of electricity which is normally the end product of geothermal production. Price differences explain the fluctuations in year-to-year revenue collections shown in the table. The MMS calculates royalties for Federal geothermal resources through indirect methods because few Federal geothermal resources are subject to a sales transaction on which to base the value for royalty purposes. This is due to the fact that most Federal geothermal lessees are also owners of the electric generating power plant.

Madame Chairman, I hope this gives the Committee a better understanding of the BLM's geothermal leasing program. I would be pleased to answer any questions that you or the other members of the Committee may have.

Mrs. CUBIN. Thank you very much, Mr. Anderson.

I will start the round of questioning. I would like to remind the members that the Committee Rule 3(C) imposes a 5-minute limit on questions.

I will start my questioning with Mr. Anderson. The BLM really has its hands full, and there is no doubt about that. And there will be more pressure brought on the BLM because of permitting that is required to meet this energy crunch that we are in and that, frankly, will not go away. We have heard in the past, and I agree, that BLM needs more resources in order to be able to perform the actions that they need to perform for permits to produce the energy. And we want to work with you on that.

Does the BLM consult with the USGS to identify known geothermal and potential geothermal areas during the scoping process for area management plans?

Mr. ANDERSON. Yes, we do.

Mrs. CUBIN. Are there any bottlenecks in the geothermal leasing process caused by conflicting requirements in different laws that you can point to?

Mr. ANDERSON. We have discussed that, both from a regulatory standpoint and statutory standpoint, and we do not think there are.

Mrs. CUBIN. Which is different than the case for other minerals, or for minerals. Because we hear all the time that there are conflicting requirements in different laws—you know, Clean Air, Clean Water, ESA, or whatever, that cause conflicts and delays in permitting.

Mr. ANDERSON. Certainly there are requirements and regulations that provide that we must comply with other Federal and state laws. And you have mentioned a few of those—Clean Air, Clean

Water, and of course the Endangered Species Act; and also, consultation with Native Americans.

Mrs. CUBIN. So is this a problem with permitting for geothermal as well as other energy sources?

Mr. ANDERSON. Well, in terms of complying with other Federal and state laws, we must do that with all permitting activities.

Mrs. CUBIN. Right.

Mr. ANDERSON. All programs— mining laws, or leasing laws, or mineral materials—must comply.

Mrs. CUBIN. What was the last plant to be built on Federal geothermal leases, and when did that occur?

Mr. ANDERSON. The Brady plant in Nevada, in 1992.

Mrs. CUBIN. And how big is that plant?

Mr. ANDERSON. It's about 24 megawatts.

Rich Hoops, by the way, is the staff behind me. He is our person from BLM Nevada who is probably the foremost expert in geothermal resources.

Mrs. CUBIN. Good. Thank you. We need you guys.

Now I would like to ask Dr. Williams, the Great Basin area in the Western United States is clearly the best place now to be looking for geothermal energy potential. But electricity has to be routed a long distance to markets, so transmission losses are significant. Would you agree with that? Are there direct use applications that could utilize geothermal heat to manufacture a product more efficiently, or to increase crop yields?

Dr. WILLIAMS. Oh, yes, there are abundant direct use applications in the Great Basin and in other parts of the West, extending into the Pacific Northwest and farther east. With some of those, the current uses have just barely scratched the surface of that.

Mrs. CUBIN. Could you give me some examples of some of those potential things?

Dr. WILLIAMS. Direct use has the potential to be of great value in providing district heating for remote communities. It has a potential for various types of agricultural process heat. There have been a number of different uses of direct heat in industrial applications.

Mrs. CUBIN. Thank you. Dr. Dixon, President Bush just yesterday said that Federal buildings and facilities, especially in the West, should lead the way in electricity conservation. Are there economic ways for the Federal Government to heat and cool their buildings with geothermal heat exchanges to reduce electricity demand?

Dr. DIXON. Thank you, Madam Chairman. Yes, we believe there are a number of steps that can be taken. There are a number of steps that we are currently taking. At the Federal Energy Management Program, which resides at the Department of Energy—a sister office of my own—we work very closely together to develop a wide range of renewable energy sources, including geothermal.

We also have a network of regional offices across America. We work with the states; not only Federal facilities, but state government facilities. We have identified a number of pilots in this area, and we have solicitations to work with governments on this topic.

Mrs. CUBIN. Thank you. The Chair now recognizes Mr. Kind.

Mr. KIND. Thank you, Madam Chair. And thank you again for your testimony.

I would like you to respond to this. This is part of the problem I see, as far as the development and the future of geothermal. I think we are seeing this right now with the energy crunch that we have around the country, and the $2-plus gas prices in the Upper Midwest. We need to have marketing incentives to make the initial up-front investment and then to proceed on to these renewables. What types of incentives do we need to put in place in order to encourage the type of investment that is going to be needed in order to make geothermal a significant piece of the energy pie?

And it is my understanding now that with the gas price increase in the Midwest, it is not so much a matter of supply, but lack of refinery capacity. Our refineries are working at 98 percent capacity. We have not done any major investments in new refineries in the country because of the once cheap gas supplies and abundant gas supplies in the not too distant past, so there was not any marketing incentive for the companies to make these investments up front.

What types of incentives do you think are necessary to encourage these types of investments in the future? Dr. Dixon, let's start with you.

Dr. DIXON. Thank you. I would be pleased to answer your question. We think there are a number of things that can be done to help realize the potential of geothermal energy. Certainly, we need to take a long, hard look at the tax treatment of geothermal energy resources.

Secondly, I think we are all here to tell you today that we need to deal with the regulatory and policy environment. There are things we can do in the Federal Government, working with state governments and partnerships with the private sector. And I am very pleased to see that the private sector will be the second part of the testimony today, because we are talking about partnerships here, meaningful partnerships.

Third, we need to work on some of the transmission and distribution issues. Direct heat is also important, and particularly for those 300 towns and cities in the Western U.S. that sit very near to or on top of geothermal deposits. But wheeling the energy across the country is something which the Federal Energy Regulatory Commission, the Department of Energy, and others, we all have a piece of that action. We need to work together better, smarter, in the future to deal with some of these issues.

And then finally, I do not want to leave out the fact that we need to continue to work together and invest in characterizing the resource, identifying where the resource is and, in fact, continue to develop the technologies needed to harvest the resource on an economic basis. I mentioned during my testimony that it is not only technology issues, but also economic issues. We need to understand the full range of benefits, the co-benefits, mineral extraction and other topics.

So those are some topics that are on my mind this morning. I would be glad to elaborate further, but I will turn the microphone to other witnesses if they care to respond.

Mr. KIND. Do any other witnesses care to comment?

Mr. ANDERSON. I think we have a good opportunity, with the Federal Government, BLM, and the Forest Service. Perhaps one of the most important things is access to these resources. As we proceed with updating our land use plans, we need to have our managers realize the scarcity of the values and the energy demands being placed on us now—in consideration, of course, of the other resources—and make those decisions, based on that scarcity of value.

In addition, we need a consistent process for the way we proceed with applications. We need to have a process that is consistent among the states in the way we approach these permiting and leasing applications, in order to get through these processes in a timely manner.

Mr. KIND. Mr. Anderson, let me follow up on that. Is it quick with resources right now? I am pretty confident that the second panel is going to be talking a little bit about the process and the permitting obstacles that they have confronted. And I am a little bit concerned.

I appreciate the fact that we have a President who is using geothermal sources for heating his own water in a ranch down in Texas. But the bid that was submitted—and correct me if I am wrong—I think it is only calling for a $50,000 increase in the permitting process for BLM land. Is that going to be enough for you to get to the point where you can streamline this—especially in light of your testimony and the factors that you all are working under—to streamline the permitting process?

Mr. ANDERSON. Well, of course, we have to work within the constraints of the 2002 budget, and the $50,000 increase is for that year. We are going to do the best we can with that increase, starting with Nevada. We are going to give that money to Nevada to help them with their processing. We could always use more, no question about that.

There is also an opportunity to shift priorities within what we call our "1330 Program"—that is where the geothermal program is funded—to put more emphasis in geothermal, rather than perhaps maybe non-energy leasing or mineral material programs, although both of those are important as well.

Rich Hoops, who I referred to before, and the other geothermal experts in the West are working with committees and trying to get together on a monthly basis to plan for how they can best approach these applications in a streamlined fashion. So we are working on it, and we could always use more, of course.

Mr. KIND. We will be happy to work with you in the future on that and on what we can do to assist you here in Congress.

Mr. ANDERSON. Thank you.

Mr. KIND. Thank you, Madam Chair.

Mrs. CUBIN. The Chair now recognizes Mr. Gibbons.

Mr. GIBBONS. Thank you, Madam Chairman. And perhaps I could address my first question over to Dr. Williams and Dr. Dixon, with regard to the USGS and the Department of Energy studies with regard to geothermal potential. Have you completed your studies with regard to geothermal potential in Nevada?

Dr. WILLIAMS. Right now we do not really have a very active program on geothermal assessments within the USGS. The studies

were completed in the past. Much of the knowledge about specific geothermal systems within Nevada has evolved.

Mr. GIBBONS. That would be in that Circular 790 that you mentioned earlier?

Dr. WILLIAMS. Yes. And there is much more direct experience. There are holes in the ground, power plants that have been installed, histories with those systems. And so, much of that information could be updated.

Mr. GIBBONS. So not a lot would have been done in the last 10 years, is what you are saying?

Dr. WILLIAMS. No, not very much.

Mr. GIBBONS. In terms of megawatt output, how much geothermal energy, according to your knowledge—and maybe Mr. Anderson and his staff could add into this—how much geothermal energy is located in the Black Rock National Conservation Area that was created in northwestern Nevada last year with Senate Bill 2273? How much geothermal energy is in that area?

Dr. WILLIAMS. I know about the studies that have been conducted there, and I know that there is geothermal potential. I cannot say right now off the top of my head how much potential there is. I could certainly get that information and add it to the record of testimony.

Mr. GIBBONS. I would certainly appreciate that, Dr. Williams.

[The information referred to follows:]

Geothermal Resources In The Black Rock Desert National Conservation Area

Colin F. Williams
U.S. Geological Survey
March 20, 2002

Overview

The Black Rock Desert in northwestern Nevada is a region characterized by numerous hydrothermal systems, with the major hot springs and thermal manifestations located on or near active faults (Sass et al., 1979). The available evidence suggests that the thermal water flowing from the hot springs is heated by circulating deep into the Earth's crust along permeable fault planes, reaching depths as great as 3 miles (Sass et al., 1979; Mase and Sass, 1980). This heating process is facilitated by the high geothermal gradients that are found in northern Nevada. The many springs and thermal features were studied in the preparation of USGS Circular 790, Assessment of Geothermal Resources of the United States ? 1978 (Muffler, 1979), and more than 100 geothermal exploration wells have been drilled in the Black Rock Desert area. These in situ studies have been supplemented by extensive geological and geophysical investigations (see studies referenced in Sass et al., 1979; Garside, 1994; Shevenell et al., 2000). Although some of the industry exploration data remain proprietary, enough is known about the Black Rock Desert to characterize the overall thermal regime and the prospects for extracting geothermal energy from specific systems.

Hot Springs, Hydrothermal Systems and Potential Electric Power Production

Two Black Rock Desert hot springs and associated hydrothermal systems, Pinto Hot Springs and Great Boiling Springs (Gerlach), are classified in Circular 790 as high temperature hydrothermal systems, which, according to the USGS classification standards for hydrothermal systems, corresponds to estimated subsurface temperatures above 302 oF or 150 oC (Muffler,1979). Both lie outside of the boundaries of the National Conservation Area and the adjacent Black Rock Desert Wilderness. Four hot springs are classified in Circular 790 as moderate temperature hydrothermal systems, which corresponds to estimated subsurface temperatures in the range from 194 to 302 oF (90 to 150 oC). These are Double Hot Springs, Black Rock Point Hot Springs, Trego Hot Springs and Fly Ranch (Muffler, 1979). All four lie within the boundaries of the National Conservation Area. A seventh area of hot spring activity, Soldiers Meadows, is located in the National Conservation Area and was classified as a moderate temperature hydrothermal system in USGS Circular 726 (White and Williams, 1975). Subsequent studies revealed it to be a low temperature system with a subsurface temperature of no more than 150 oF or 65 oC (R. Mariner, pers. comm., 2002).

Hot water discharges from the four moderate temperature hot springs at temperatures ranging from 175 to 226 oF (80 to 108 oC), but the associated subsurface temperatures, as estimated from chemical studies of the thermal waters and exploration drilling, are significantly higher. The estimated subsurface temperatures from Circular 790 (Muffler, 1979) are as follows -

- Black Rock Point ? 264 oF (129 oC)
- Double Hot Springs ? 261 oF (127 oC)
- Trego Hot Springs ? 239 oF (115 oC)
- Fly Ranch ? 226 oF (108 oC)

All of these systems have temperatures high enough for direct use applications, such as are found at the Empire vegetable dehydration plant in the San Emidio Desert to the south. Black Rock Point and Double Hot Springs fall just above the temperature (approximately 250 oF) identified

by the Bureau of Land Management as the minimum required for electric power production (R. Hoops, pers. comm., 2001). The thermal energy available for conversion to electric power can be calculated using the estimated temperatures of the hydrothermal systems (Muffler, 1979), the lateral extent of the systems as revealed by near-surface heat flow measurements (Sass et al., 1979; Mase and Sass, 1980) and the methods outlined in Circular 790 (Muffler, 1979). These calculations limit the maximum potential electric power production to less than 100 Megawatts (MW). Geothermal industry experience exploiting higher temperature geothermal resources in northern Nevada suggests that actual electric power production tends to fall below the estimates of Circular 790, and there is no reason to assume exploitation of the geothermal systems of the Black Rock Desert National Conservation Area would be any more or less successful. The temperatures for Black Rock Point and Double Hot Springs systems are estimates only and that the economic viability of electric power production at these sites depends on many factors outside the scope of this report. Further studies, particularly deep drilling, would be required to confirm the size and potential of the identified geothermal resources.

Summary

Of the seven major hot springs and associated hydrothermal systems found in the Black Rock Desert region, two, Double Hot Springs and Black Rock Point Hot Springs, lie within the boundaries of the National Conservation Area and may reach temperatures that are at the lower end of the range required for electric power production. The available geochemical and geophysical data limit the maximum electric power production potential from these two systems to less than 100 MW. The most likely application for geothermal energy from these systems would be direct use rather than electric power generation.

It is important to note the difference between an assessment of resources and and an evaluation of reserves. This report discusses the size of a geothermal resource, which is an estimate of the thermal energy that could be extracted from an identified hydrothermal system assuming foreseeable progress in energy production technology and a competitive economic environment. In most cases only a fraction of a geothermal resource can be considered as a reserve, which is a proven resource that can be exploited for energy production using existing technology and under current economic constraints. Many significant economic and engineering issues would have to be resolved before any part of the geothermal resource contained within the Black Rock Desert National Conservation Area could be classified as a reserve.

References

Garside, L., 1994, Nevada Low-Temperature Geothermal Resource Assessment, Nevada Bureau of Mines and Geology Open-File Report 94-2.

Shevenell, L., L.J. Garside, R.H. Hess, 2000, Nevada Geothermal Resources, Nevada Bureau of Mines and Geology Map 126.

Mase, C.W., and J.H. Sass, 1980, Heat Flow from the Western Arm of the Black Rock Desert, Nevada, USGS Open-File Report 80-1238, 38p.

Muffler, L.P.J., (ed.), 1979, Assessment of Geothermal Resources of the United States ? 1978, USGS Circular 790, 164p.

Sass, J.H., M.L. Zoback, and S.P. Galanis, Jr., 1979, Heat Flow in Relation to Hydrothermal Activity in the Southern Black Rock Desert, Nevada, USGS Open-File Report 79-1467, 39p.

White, D.E., and Williams, D.L., 1975, Assessment of Geothermal Resources of the United States ? 1975, USGS Circular 726, 155 p.

Mr. GIBBONS. I am looking at your heat flow chart in your publication here, which shows greater than a 100-megawatt production area in that northwest area of Nevada, which is exactly where the national conservation area is located.

Let me turn the question over to Mr. Anderson. Mr. Anderson, you know about the Black Rock Desert National Conservation Area, because that is part of the BLM's management policy out there. How much of the geothermal that is listed by the USGS is available for production in the national conservation area?

Mr. ANDERSON. Because of the national conservation area designation, it is withdrawn from leasing on Federal lands.

Mr. GIBBONS. So none of it is available?

Mr. ANDERSON. None of it is available.

Mr. GIBBONS. Mr. Anderson, in view of the recent energy crisis which is sort of sweeping the West, would you be willing to make any recommended changes to the Black Rock Desert National Conservation Area to allow development of that geothermal energy resource?

Mr. ANDERSON. I can't really speak to that, in terms of a "Yes" or a "No" today. But I could just tell you—and you probably know this—that Secretary Norton has sent letters to the governors of states where recent national monuments have been designated, asking them if it would be necessary or conducive to change boundaries of those areas in order to provide for certain activities such as energy production to occur.

Mr. GIBBONS. Well, with 1,300,000 acres, certainly the footprint of geothermal energy wouldn't consume a great deal of that BRDNCA. I am not sure that the footprint of the geothermal production facilities would by any means destroy the historic or the cultural values that we tried to protect with the BRDNCA. I certainly would appreciate any review by the Administration of those considerations in the BRDNCA.

Let me ask also another question. Would you be willing to change the royalty mix, or the distribution of the royalty income, so that more of that royalty resource goes to the permitting process in your facility, or your department?

Mr. ANDERSON. Well, of course, I cannot provide a "Yes" or "No" on that, too. But it seems to me, you are talking about some kind of a cost recovery or reimbursement plan?

Mr. GIBBONS. Well, much the same as we do in other industries that have a royalty. We use part of that income stream to cover the cost and the expenses of the permitting process, to expedite the permitting process. It seems to me that that would be the identified and true national benefit of having a royalty, is to permit an expedient, fast process for looking at these systems and getting the process through the system of bureaucracy. And that is what I am directing my question to.

Mr. ANDERSON. Yes, it sounds like it has merit. And we would sure be willing to take a look at that and give you some recommendations, if you would like.

Mr. GIBBONS. Thank you. Thank you, Madam Chairman.

Mrs. CUBIN. The Chair now recognizes Mrs. Napolitano. I do not care; whoever wants to go first. I am doing in order of people that showed up.

Mrs. NAPOLITANO. Thank you, Madam Chair.

One of the things that I was honing in on was the fact that I believe it was Mr. Anderson that indicated that there were private projects going on with the State of California. Is that right? In regard to the heating of buildings, or the ability to be able to utilize thermal energy facilities; or in other words, the energy provided by that to heat some of the buildings. Was it Mr. Anderson, or was it Dr. Dixon? I am not sure which one of you talked about it, but one of you mentioned it and it caught my attention.

Where are those pilots, and are they up and running? And how can that be expanded? How is it being formulated? The lease is already there, the electricity is already being utilized? Would you explain?

Dr. DIXON. Yes, I would be glad to try to answer your question. I cannot be specific, but I will answer the best I can this morning, and will be glad to get back with a more detailed answer on the record.

We have an Office of Wind and Geothermal Energy at the Department, and we have issued a number of solicitations which provide opportunities for the private sector or government entities to work in partnership with the Department to explore resources, to develop the resources. There is a full range of solicitations. I will be glad to provide that list to you for the record.

[The information referred to follows:]

U.S. Department of Energy
State Energy Program Special Projects

Geothermal Heat Pumps

Project Title/Activity	State	Federal Contribution	Non-Federal Contribution	Completion Date
Geothermal Heat Pumps Program/public outreach	ID	$24,000	$8,000	6/30/98
Geothermal Heat Pumps/elementary school	MD	$50,000	$19,000	6/01/99
Study and Promotion of Ground Source Heat Pumps in Severe Winter Climates/ marketing plan	MN	$48,000	$24,000	6/30/98
Environmentally and User Friendly Regulations for Geothermal Heat Pump Systems in New Jersey/case study	NJ	$50,000	$32,000	7/31/99
Technical Assistance for Geothermal Heat Pumps/training and feasibility studies	NY	$50,000	$130,000	9/30/99
Geothermal Heat Pumps/rebates	OH	$45,000	$259,000	9/30/99
Geothermal Heat Pumps/feasibility study	RI	$50,000	$20,000	9/30/98
Support Installation of Geothermal Heat Pump and Training for Contractors/pubic awareness and training at three sites	SC	$50,000	$103,000	9/30/99
Geothermal Educational Workshops/outreach to school administrators	AR	$25,000	$10,000	6/30/01
Geothermal Heat Pump Workshop and Information Dissemination/ education and marketing	IA	$50,000	$49,900	7/31/00
Geothermal Heat Pump Training Program/education and outreach	NE	$50,000	$70,000	6/30/00
Increasing GHP Utilization in New Jersey Schools/outreach to school districts	NJ	$50,000	$74,721	9/30/00
Geothermal Heat Pump Technical Assistance for New York State Schools/outreach to school districts	NY	$50,000	$70,000	9/30/00
Geothermal Heat Pumps for Energy Smart Schools in Virginia/video workshops	VA	$73,540	$52,546	9/30/00
Wisconsin's Geothermal Heat Pump Partners for Schools/workshops and marketing plan	WI	$47,107	$65,052	12/31/00

DEPARTMENT OF ENERGY GEOTHERMAL POWER CONTRACTS

Project Area	Private Sector Partners	Project Location	FY 2000 DOE Funding	Total DOE Funding	Private Funding
Small-Scale Geothermal Electric Power Plants	Empire Energy LLC, Empire, NV	Empire, NV	$150,000 prior year money	$1,600,000/4 years	$600,000
	Exergy, Inc., Hayward, CA	Cotton City, NM	$150,000 prior year money	$1,700,000/4 years	$1,600,000
	Milgro Newcastle, Inc., Newcastle, UT	Newcastle, UT	$150,000 prior year money	$1,100,000/4 years	$1,400,000
	ORMAT International, Inc., Sparks, NV	Lordsburg, NM	$150,000 prior year money	$1,596,000/4 years	$1,604,000
	Vulcan Power Company, Bend, OR	Radium Springs, NM	$150,000 prior year money	$500,000/4 years	$1,900,000
Enhanced Geothermal Systems Technology	Americulture, Inc., Los Alamos, NM	Animas Valley, NM	$177,000	Funding being awarded through evaluation. **	
	Drilling, Observation and Sampling of Earth's Continental Crust, Inc., Salt Lake City, UT	The Geysers, Santa Rosa, CA	$199,917	Funding being awarded through evaluation **	
	Maurer Engineering, Inc., Houston, TX	The Geysers, Santa Rosa, CA	$194,554	Funding being awarded through evaluation **	
	Northern California Power Agency, Middleton, CA	The Geysers, Santa Rosa, CA	$174,584	Funding being awarded through evaluation **	
	ORMAT International, Inc., Sparks, NV	Animas Valley, NM	$200,000	Funding being awarded through evaluation **	
	Power Engineers, Inc., Hailey, ID	Roosevelt Hot Springs, UT	$191,615	Funding being awarded through evaluation **	
	Steamboat Envirosystems, LLC, West Palm Beach, FL	Reno, NV	$199,805	Funding being awarded through evaluation **	
	ThermaSource, Inc., and RES Company, Santa Rosa, CA	The Geysers, Santa Rosa, CA	$198,630	Funding being awarded through evaluation	
	University of Utah, Salt Lake City, UT	The Geysers, Santa Rosa, CA	$199,973	Funding being awarded through evaluation **	
Geothermal Resource Exploration and Definition	Calpine Siskiyou Geothermal Partners Limited Partnership, Middletown, CA	Glass Mountain, CA	$202,371	$1,102,371/3 years	$275,593
	Coso Operating Company of Caithness Resources, Inc., Ridgecrest, CA	U-boat, NV	$300,000	$1,875,000/3 years	$500,000
	Mount Wheeler Power Company, Ely, NV	Rye Patch, NV	$20,000	$1,620,000/3 years	$405,000
	Noramex Corporation, Carson City, NV	Blue Mountain, NV	$21,600	$656,736/3 years	$164,184
	ORMAT International, Inc., Sparks, NV, and Lightning Dock Geothermal Inc., Las Cruces, NM	Animas Valley, NM	$245,000	$913,000/3 years	$245,500
	SB Geo, Inc., Reno, NV	Steamboat Springs, NV	$14,792	$269,792/3 years	$67,448
	Utah Municipal Power Agency, Spanish Forks, UT	Cove Fort-Sulphurdale, UT	$23,057	$366,057/3 years	$91,514

We are also working through our regional offices. The Department of Energy has regional offices in six different locations. We work with state governments. We provide technical assistance. We provide financial assistance. And we organize workshops.

I wanted to respond earlier to Mr. Gibbons' question, that we have been very active in the State of Nevada. We organized, just for an example, a workshop in the State of Nevada, at Reno, in which we involved Congressional delegations and in which we took a look at the current resources, what we could do to develop the resources in the future; worked with the state geologist and various stakeholders and actors in that particular arena to help advance the ball, so to speak, to characterize the resources, to identify the technology bottlenecks, as well as the siting and permitting kinds of issues and the access.

We are also working in the arena of the direct use of heat for heating and cooling systems for towns and cities; again, a broad range of financial assistance, solicitations, that can deal with this issue.

The Department, as you know, engaged in, and actually it was a very healthy program, in which we developed the technologies for geothermal heat pump systems. And of course, we handed that off to the private sector several years ago. And of course we have seen an explosion of the use of direct heat cooling systems—the reference to President Bush's ranch in Crawford, Texas. But certainly, this technology was developed at the DOE complex, and then handed off—rightly so—to the private sector, and is now a robust activity.

So those are some of the activities we have underway. We will be glad to provide more information on the record.

Mrs. NAPOLITANO. Thank you. I was under the impression that you already had some kind of a program or pilot commencing in an area—whether in Nevada or California—that at least gave us an idea that we may be able to promote or try to sell our municipalities into taking a look at becoming part of. If you have programs or workshops, that will allow them to begin to understand how they can tap into it, especially in my area. I have no geothermal in L.A. County, or at least in my district. So that would have to be braided in, so to speak. In other words, I cannot produce it there.

But we have had in the past suggestions that we may be able to use the water mains—12-inch, I believe it is—to be able to generate the cooling systems and heating systems for, say, a civic center area, by utilizing the systems that provide like your camper packages, keep your food cold, that kind of generation of cooling, and then of course providing some heating.

I don't know, there are all kinds of things that we want to learn, so that we can find out what agencies are working, what programs do you have, what services are you offering? What is it that we can take back and offer so that we can begin to gear up for not just the energy crisis, but the solutions, so that we can make our citizens a little more comfortable in their daily life and in their work sites?

Dr. DIXON. Yes, well, again, we have a full range of activities, financial assistance, technical assistance—

Mrs. NAPOLITANO. But you do not have ongoing programs.

Dr. DIXON. Yes, we do.

Mrs. NAPOLITANO. Where?

Dr. DIXON. The Federal Energy Management Program, which is a Department activity. We have partnerships with Federal facilities across the United States. There are also specific grants through our regional offices to states and municipalities. I cannot tell you off the top of my head for the record, but I will provide them.

Mrs. NAPOLITANO. Could you provide it?

May I, Madam Chair, ask that it will be provided to the members of this committee?

Dr. DIXON. I will be happy to.

Mrs. NAPOLITANO. So that at least some of those that are interested might be able to tap into those resources.

Mrs. CUBIN. Certainly.

Mrs. NAPOLITANO. Thank you.

[The information referred to follows:]

Geothermal Heat Pump Installations at Federal Facilities

Agency	Facility	City	State	Financing (A=appropriations; UESC or ESPC)	Calender Year Built	Estimated total tons	Estimated cost (2001)
Projects Already Constructed							
Army	Fort Polk	Leesville	LA	A	1993	81	$290,000
Army	Fort Polk	Leesville	LA	A	1993	111	$400,000
Navy	Patuxent River Naval Air Station	Patuxent R. NAS	MD	A	1993	19	$70,000
HUD/Fed-Assisted Housing	Park Chase	Tulsa	OK	A	1993	630	$2,280,000
Army	Fort Polk	Leesville	LA	A	1994	95	$340,000
Army	Fort Polk	Leesville	LA	A	1994	95	$340,000
Army	Fort Polk	Leesville	LA	A	1994	95	$340,000
Army	Fort Polk	Leesville	LA	A	1994	5	$20,000
Army	Ft. Hood	Fort Hood	TX	A	1994	6	$20,000
BIA/IHS	Pine Ridge Staff Quarters	Pine Ridge	SD	A	1994	145	$520,000
BIA/IHS	Regional Supply Service Center	Ada	OK	A	1994	100	$360,000
BIA/IHS	Rosebud Hospital Staff Quarters	Rosebud	SD	A	1994	215	$770,000
Army	U.S. Army Corps of Engineers, 2 Bldgs	Walla Walla	WA	A	1995	286	$1,270,000
Navy	Patuxent River Naval Air Station	Patuxent R. NAS	MD	A	1995	114	$410,000
Army	Fort Riley	Manahatten	KS	A	1995	51	$180,000
Army	Selfridge Air National Guard	Detroit	MI	A	1995	6	$20,000
USPS	Trappe Post Office	Trappe	MD	A	1996	5	$20,000
USPS	Cordova Post Office	Cordova	MD	A	1996	4	$10,000
Army	Fort Polk	Leesville	LA	ESPC-Army	1996	6593	$21,600,000
Navy	Pensacola Naval Air Station	Pensacola	FL	UESC	1996	400	$1,450,000
HUD/Fed-Assisted Housing	Hillside Oaks	East Dallas	TX	A	1996	310	$1,120,000
HUD/Fed-Assisted Housing		Wichita Falls	TX	A	1997	100	$360,000
Navy	Pensacola Naval Air Station	Pensacola	FL	A	1997	85	$310,000
USPS	Abingdon Post Office	Abingdon	MD	A	1997	15	$50,000
USPS	Keymar Post Office	Keymar	MD	A	1997	5	$20,000
USPS	New Windsor Post Office	New Windsor	MD	A	1997	10	$40,000
Marines	Quantico Marine Corps Base	Quantico	VA	A	1997	225	$810,000
Marines	New River MCAS	Jacksonville	NC	A	1997	150	$540,000
Army	Fort Irwin	Barstow	CA	UESC	1997	600	$2,170,000
Air Force	Little Rock Air Force Base	Little Rock	AR	UESC	1998	2600	$9,400,000
HUD/Fed-Assisted Housing	Wilmington Housing Authority	Wilmington	NC	UESC-HUD	1998	500	$1,810,000

Army	Ft. Eustis	Ft. Eustis	VA	A	1998	305	$1,100,000
Navy	Washington Naval Yard	Anacostia	DC	A	1998	52	$190,000
DOE	Sandia National Lab	Albuquerque	NM	A	1998	50	$180,000
Navy	Naval Security Group Northwest	Chesapeake	VA	A	1998	175	$4,540,000
Air Force	Hurlburt Air Base	Ft. Walton Beach	FL	UESC	1999	170	$610,000
Navy	Naval Air Station Oceana	Virginia Beach	VA	A	1999	100	$360,000
Navy	Naval Air Station Oceana	Virginia Beach	VA	A	1999	100	$360,000
Navy	Naval Air Station Oceana	Virginia Beach	VA	A	1999	100	$360,000
Army	Ft. Riley	Manhatten	KS	A	1999	306	$1,110,000
Air Force	Hurlburt Air Base	Ft. Walton Beach	FL	UESC	1999	170	$610,000
Navy	Naval Air Station Whiting Field	Milton	FL	UESC	1999	560	$2,030,000
Army	Fort Eustis	Ft. Eustis	VA	A	1999	50	$180,000
USPS	Accident Post Office	Accident	MD	A	2000	8	$30,000
FAA	FAA Control Tower	Kansas City	MO	A	2000	18	$70,000
USPS	Monrovia Post Office	Monrovia	MD	A	2000	8	$30,000
USPS	Pocomoke City Post Office	Pocomoke City	MD	A	2000	8	$30,000
USPS	Thurmont Post Office	Thurmont	MD	A	2000	8	$30,000
USPS	Union Bridge Post Office	Union Bridge	MD	A	2000	8	$30,000
Army	Ft. Dietrick	Frederick	MD	A	2000	8	$30,000
Marines	Quantico Fire Station	Quantico	VA	A	2000	10	$40,000
Air Force	Tyndall Air Force Base	Panama City	FL	UESC	2000	918	$3,320,000
Army	U.S. Army Corps of Engineers, 2 Bldgs	Lake Wapapello	MO	A	2000	50	$180,000
Air Force	Eglin Air Force Base	Ft. Walton Beach	FL	UESC	2000	680	$2,460,000
Air Force	Bolling AFB	Washington	DC	A	2000	100	$360,000
Air Force	Dyess AFB	Abilene	TX	A	2000	100	$360,000
Air Force	Hill AFB	Ogden	UT	A	2000	100	$360,000
Air National Guard	MacDill	Tampa	FL	A	2000	100	$360,000
Army	Fort Bragg	Ft. Bragg	NC	A	2000	100	$360,000
Army	Fort Meade	Ft. Meade	MD	A	2000	100	$360,000
Army	Hunter Army Air Field	Ft Stewart	GA	A	2000	100	$360,000
Air Force	Charleston Air Force Base	Charleston	SC	ESPC-Army	2001	3200	$6,500,000
HUD/PATH		Tacoma Park	DC	A	2001	300	$1,090,000
Marines	New River MCAS	Jacksonville	NC	A	2001	150	$1,300,000
Projects Awarded/In Construction							
Navy	Patuxent River Naval Air Station	Patuxent R. NAS	MD	Super ESPC TS	2000	340	$4,920,000
State	Ambassador's residence, family housing	Seoul, S. Korea		Super ESPC TS	2001	900	$5,150,000
Marines	Marine Corps Camp Lejeune	Jacksonville	NC	UESC	2001	3500	$15,000,000
Marines	Beaufort Marine Corps Air Station	Beaufort	SC	UESC	2001	2164	$9,000,000
Navy	Pensacola Naval Air Station	Pensacola	FL	A	2001	15	$130,000
Army	Washington Military District	Washington	DC	ESPC-site spec	2001	100	$360,000
Navy	Naval Air Station Oceana	Virginia Beach	VA	A	2001	250	$900,000

Projects in Development Phase							
Navy	NAS Oceana/AMPHIBAS Little Creek	Virginia Beach	VA	Super ESPC TS	2002	2000	$7,000,000
Army	Rock Island Arsenal	Rock Island	IL	Super ESPC TS	2002	4000	$23,000,000
Marines	Beaufort Marine Corps Air Station	Beaufort	SC	Super ESPC TS	2002	700	$3,500,000
Army	AWC Carlisle Barracks	Carlisle	PA	Super ESPC TS	2002	1190	$7,600,000
Army	Selfridge Air National Guard	Detroit	MI	Super ESPC TS	2002	1266	$4,580,000
Army	Fort Polk	Leesville	LA	Super ESPC TS	2001	7188	$26,000,000
Army	Aberdeen Proving Grounds	Aberdeen	MD	Super ESPC TS	2002	1242	$4,990,000
Army	Fort Leavenworth	Leavenworth	KS	Super ESPC R	2002	2340	$6,330,000
Army	Fort Bliss	El Paso	TX	Super ESPC R	2002	750	$3,650,000
Army	Fort Jackson	Columbia	SC	Super ESPC R	2002	3433	$10,760,000
Army	Ft. Monmouth	Monmouth County	NJ	A	2002	150	$540,000
Army	Ft. Monmouth	Monmouth County	NJ	A	2002	140	$510,000
Army	Ft. Drum	Watertown	NY	A	2002	80	$290,000
HUD/Fed-Assisted Housing	Springfield Housing Authority	Panama City	FL	A	2002	78	$280,000
VA	Veterans Administration Hospital	Norman	OK	A	2002	525	$1,900,000
Potential Projects in Pipeline							
EPA	EPA Laboratory	Ada	OK	Super ESPC R	2003	150	$540,000
Navy	US Naval Observatory	Washington	DC	A	2003	110	$400,000
Army	CT Army National Guard	Hartford	CT	ESPC-Army	2003	210	$760,000
USPS	USPS Baltimore Region	various	MD	A	2003	200	$720,000
USPS	USPS Southwest Region	various		A	2003	190	$690,000
USPS	USPS Owens Mills Main Facility	Owen Mills	MD	A	2003	85	$310,000
Marines	MCLB Barstow	Barstow	CA	A	2003	3000	$10,850,000
Marines	MGAC 29 Palms	29 Palms	CA	A	2003	1000	$3,620,000
FAA	Charleston Passport Center	Charleston	SC	A	2003	600	$2,170,000
NPS	Vanderbilt Mansion	Hyde Park	NY	A	2003	125	$450,000
NPS	FDR Mansion	Hyde Park	NY	A	2003	100	$360,000
NPS	Longfellow Mansion	Cambridge	MA	A	2003	60	$220,000
NPS	Fort Necessity	Farmington	PA	A	2003	30	$110,000
Navy	NA Corry Station	Pensacola	FL	UESC	2003	2500	$9,040,000

UESC = Utility Energy Service Contract
ESPC = Energy Savings Performance Contract

Mrs. CUBIN. The Chair now recognizes Mr. Rehberg.

Mr. REHBERG. Thank you, Madam Chairman.

Dr. Williams, I realize the geothermal resource map that we are looking at is not intended to be a precise map, but as I look at northwest Wyoming and think of Yellowstone Park, would you intend it to be—I do not mean a potential source of geothermal, but would it be considered good to excellent?

Dr. WILLIAMS. Oh, certainly, if that was considered an accessible geothermal resource.

Mr. REHBERG. Give me directions. I am trying to find what you determined in your earlier studies to be good to excellent. Having staffed this committee back 20 years ago in 1981, Baker, Montana, which is in eastern Montana, got all excited about the potential for geothermal. And I assume that they found that source as the result of oil well drilling in that area. And I notice on the map it does not show up as a potential. So I am thinking to myself perhaps it does not have the same opportunity or potential because it is of a different temperature.

Dr. WILLIAMS. Generally, as the very first order, you need the temperature. The second thing you need for classic geothermal systems is a fluid. You need rock that you can move natural fluid through. And so when you consider something like Yellowstone, where you have the natural geysers and everything, there is all the heat and fluid right there, practically at the surface.

And so many cases—I cannot speak specifically to the one you mentioned—but often in cases in which people thought there was a geothermal resource and it did not pan out, it is usually because the near-surface indications of what the temperature would be at depth turned out not to be confirmed; that things were either cooler at depth or there was not an available fluid to use to exploit the system.

Mr. REHBERG. I would assume that the term "geothermal" means the heat source, as opposed to the water itself.

Dr. WILLIAMS. Yes. I mean, just specifically, the term "geothermal" refers to the earth's heat.

Mr. REHBERG. Does it occur in like an artesian situation, where you go in and you drill a well and it will automatically come to the surface?

Dr. WILLIAMS. It certainly can, yes. But it does not have to. It does not have to.

Mr. REHBERG. In reading your testimony, it suggests that the cost of drilling the geothermals is so much more expensive. What about the geology creates that situation? It would seem like it would be just as easy as drilling in any oil well situation.

Dr. WILLIAMS. It varies. Some of them are pretty much very similar to oil well drilling technology. But in other cases, for example, the Geysers Geothermal Field north of San Francisco is what we call a vapor-dominated reservoir. It is a steam reservoir. And so when they reach the reservoir, they have to use air drilling.

Also, geothermal wells require a very large diameter in order to get proper production out. And the larger the diameter of the well that is drilled, the more expensive it is.

Mr. REHBERG. In your testimony, looking at the pictures of the facilities and of the plants, maybe you cannot tell me and maybe

this is beyond your expertise, but are those one well, two wells, three wells?

Dr. WILLIAMS. For individual power plants?

Mr. REHBERG. Yes.

Dr. WILLIAMS. They are usually on the order of a half-dozen to a dozen wells, something on that order, for a single power plant. It varies, of course, because many power plants are of different size and capacity, but that would be typical.

Mr. REHBERG. Mr. Anderson, if I could ask you a question about transferring the water from basins, is that one of the environmental concerns that exist when we talk about it? I remember Mo Udall always wanted a coal slurry pipeline. And it turned out, he did not really want our coal from Montana; he really wanted our water.

Mr. ANDERSON. Yes.

Mr. REHBERG. We caught him. Is there a concern among the states or within the agencies?

Mr. ANDERSON. Sure. There is a concern. You see that with the development of coal-bed methane right now in Wyoming; there are a lot of water issues there. And with the geysers, for example, in California, the city of Santa Rosa, if I am correct, is transporting their sewer water—of course, they clean it up first—into the geysers, to recharge the hot-body system. There is also another opportunity from one of the other communities there to do the same thing. We actually saw a decline in the pressure there in the geysers a couple of years ago, but it appears that it is coming back because we are able to reinject that water.

If you take the water from another source, you are going to be criticized perhaps, because you are robbing "Peter" to pay "Paul," so to speak. You would be taking it away from agriculture, for example, so it is a sensitive area.

Mr. REHBERG. Madam Chair, I just had a question. Perhaps it has been answered. Do we have the '91 assessment somewhere in our information?

Mrs. CUBIN. No, we do not.

Mr. REHBERG. I think it is referred to. And Dr. Williams, I think you had mentioned it, or someone did, that there was another assessment in '91. And I was just wondering if that was available for us.

Dr. WILLIAMS. The last national assessment we did was the 1978 one. But I know the DOE has looked at this.

Dr. DIXON. Yes, sir. It is in the Department of Energy testimony. And we would be glad to provide a copy for the record.

Mr. REHBERG. If you could, thank you. I would like to take a look at that if I could, please. Thank you.

[The information referred to above, Department of Energy/Energy Information Administration Assessment on Geothermal Energy in the Western United States and Hawaii: Resources and Projected Electricity Generation Supplies, has been retained in the Committee's official files]

Mrs. CUBIN. One last thing. In other hearings we have tried to address how to help the land agency to be able to process permits more quickly and still have the same work product, have a good work product. And we have discussed in the past the idea of allow-

ing some of the royalty that is generated in a particular BLM region, for example, to stay in that region, because that is where the biggest need is.

And since especially, comparatively speaking, the royalty from geothermal is not very much, it might be better, instead of putting that back into the General Fund, to leave a portion of that money in the area where the permitting and the siting and all take place. That might expedite it. Do you have opinions on that?

Mr. ANDERSON. Well, Mr. Gibbons asked a similar question, and I think that proposal has merit. It is comparable to the services we provide for recreation. We are getting fees for recreational purposes, and it is sort of along the same line. Those fees would go back to the office that is providing the service. I think it has merit. And we could certainly explore that.

Mrs. CUBIN. Well, the Congress, I think, has a huge role in untangling the web that we have created through laws and that has been created through regulations that just make such a tangled mess of regulations. It is very difficult and time consuming and expensive to get through the process. Well, thank you very much.

Mr. GIBBONS. Madam Chairman.

Mrs. CUBIN. Yes? Mrs. Napolitano? Sure.

Mrs. NAPOLITANO. One of the things that also is interesting to note is that there are leases that are not being utilized. And that goes either to Mr. Anderson or Mr. Dixon. And I am wondering whether you can tell us the reason you believe these are not operable, or the reason why they are not functioning.

Mr. ANDERSON. I think in the past we have not had the pricing scenarios that we have today, and rolling blackouts, such that certainly the price of energy is going up. We are beginning to see an increase of activity in our offices, in terms of new applications. And I am sure some of the applications or leases that we have on record now will be seeing more activity in terms of plans of operations to perhaps set some of those up with a power plant.

It is a little too early to say, but a lot depends on the resource potential of that particular heat source, and the distance to the market, environmental considerations, and so on. But they all play a role in determining whether or not these undeveloped leases actually are developed.

Mrs. NAPOLITANO. For a developable lease, what would be a time frame for it to be up and running and producing?

Mr. ANDERSON. Well, we have 29 power plants. And if I were to guess, I would say that nearly all of those were permitted in less than 2 years.

Mrs. NAPOLITANO. In less than two. Is there a time span limit on their ability to continue producing? In other words, is there a lifeline on them?

Mr. ANDERSON. Well, the Act calls for a 10-year primary term, extendable to 40 years, and then you can get another extension onto that.

Mrs. NAPOLITANO. Okay.

Mr. ANDERSON. So you have, basically, up to 90 or 100 years.

Mrs. NAPOLITANO. Thank you. Thank you, Madam Chairman.

Mrs. CUBIN. Mr. Gibbons?

Mr. GIBBONS. Thank you. It is an interesting question that my colleague proposed about the time line, and I am sure we will hear from some of our industry colleagues about how long it has taken them from the time of application to full up-and-running power plant production.

My question to Mr. Anderson is, of course, you mentioned in your testimony, which caught my attention, that the amount of royalty that was brought in over the years has changed. We started off with a $28 million income from royalty, dropping to a low point of $10 million, and now today back up to somewhere, I think you said, about $18 million in the last year.

What has been the time frame over which that drop has occurred? And what has been the cause for that reduction down to almost one-third of the royalty income at one point?

Mr. ANDERSON. The price of electricity is the main reason that you have those fluctuations. That is the basic one.

Mr. GIBBONS. What is the time frame? You started at $28 million.

Mr. ANDERSON. Yes. That was 1997, where it started out with $28 million. And in the year 2000, it was back up to $18 million. So it is over a 4-year period of time.

Mr. GIBBONS. Over a 4-year time frame. You say at some point in there that it went to $10 million in royalties.

Mr. ANDERSON. Yes, 1999.

Mr. GIBBONS. Would you mind providing for me what the cost of electrical energy was at that point in time per kilowatt hour, compare it with that, so that I can balance out what your testimony is in '97, the $28 million, to the $10 million figure, and then back up to the 18? Thank you.

[The information referred to follows:]

United States Department of the Interior

MINERALS MANAGEMENT SERVICE
Washington, DC 20240

JUN 22 2001

Honorable James A. Gibbons
Subcommittee on Energy and Mineral Resources
Committee on Resources
House of Representatives
Washington, D.C. 20515

Dear Mr. Gibbons:

In order to supplement the record, I would like to clarify a question you raised during testimony given by Mr. Robert Anderson at the May 3, 2001, hearing on geothermal resources held before the House Resources Subcommittee on Energy and Mineral Resources. You asked for the prices of wholesale electricity in California, Nevada, and Utah for the years corresponding to our summary of Federal geothermal revenues provided at the hearing.

Although geothermal royalty revenues for California and Nevada generally track the price of electricity, the Minerals Management Service does not collect the information you requested. (Note that Utah revenues are not based on electricity prices because of different valuation procedures.) Our search of publicly available sources found definitive wholesale prices only for California for the time period beginning April 1998 (our summary of geothermal revenues included 1997). Based on monthly averages given in the California Energy Commission's Web site, the annual average wholesale electricity prices for California are:

April - December 1998	$25.82/MWh
1999	$28.72/MWh
2000	$95.26/MWh

These averages were based on the open market prices set by the California Power Exchange beginning April 1, 1998, when California deregulated its wholesale power market. They would be representative of prices received by the California geothermal power producers as well as the Nevada geothermal power producers, such as Beowawe and Dixie Valley, selling into the California market. We were unable to find similar information for Nevada and Utah. Also, according to sources at the Department of Energy and Federal Energy Regulatory Commission, they do not have the requested information.

I hope you find this information useful. If you need further information please call Ms. Lyn Herdt, Chief, Office of Congressional Affairs, at (202) 208-3985.

Sincerely,

Thomas R Kitsos

Thomas R. Kitsos
Acting Director

Copy to: Honorable Barbara Cubin, Chairman
Honorable Ron Kind, Ranking Minority Member

Mr. ANDERSON. I think Mr. Corley has some input in that.

Mr. CORLEY. Thank you, Mr. Gibbons. Our royalties are tied to the price of electricity. Around 1997, prices for California were about 3 to 7 cents a kilowatt hour. They were very low at that time. Since then, of course, with the supply problems with California, the energy demand has caused an increase in electricity prices. So we are seeing higher royalties.

Mr. GIBBONS. Thank you.

Mrs. CUBIN. We thank the panel very much. Mr. Flake, did you have any questions of the panel?

Mr. FLAKE. No questions.

Mrs. CUBIN. Mr. Rehberg, did you have anything further?

Mr. REHBERG. No, Madam Chairman.

Mrs. CUBIN. Thank you very much for being here. We do appreciate your testimony. And I know that members of this subcommittee will have some additional questions for you. And we would ask that you would respond to those in writing, and we appreciate it very much.

[Whereupon, members of the first panel were excused.]

Mrs. CUBIN. I now would like to recognize the second panel of witnesses: Mr. Karl Gawell, the executive director of Geothermal Energy Association; Mr. Jack Pigott, electric regulatory director, Calpine Corporation; Mr. Ross Ain, senior vice president of Caithness Energy.

Okay. Yes, and Mr. Kenneth Hoffman is accompanying Mr. Ain.

The Chair now recognizes Mr. Gawell to testify for 5 minutes. And I would like to remind you as well that the timing lights are on. Also, be sure that the microphone is close enough, because this is transmitted over the Internet.

STATEMENT OF KARL GAWELL, EXECUTIVE DIRECTOR, GEOTHERMAL ENERGY ASSOCIATION

Mr. GAWELL. It is a pleasure to actually be the second panel, so I can skip a lot of the basics about geothermal energy. Plus, there are so many Westerners on this subcommittee—I think that, in fact, one of the few geologists in Congress actually is here today—that have some understanding that the earth is hot and that geothermal energy is theoretically the largest renewable resource we have. The question is: How do you tap it? How do you use it economically?

The Geothermal Energy Association, which I represent, is a trade association of about 83 companies and organizations that are in this business, from direct use to power production. We have a lot of small companies, a lot of power producers, power plant developers, that the two other panelists here today will represent as well, and a lot of companies that are in the business. Halliburton, Weatherford, a lot of the companies in the oil field business are also in geothermal as part of their operation.

In fact, I joined with Dr. Mike Wright in giving a paper to the American Association of Petroleum Geologists looking at how geothermal is actually a field with a lot of future for people in the oil business, because a lot of the same technologies, techniques, and skills are used in both industries.

Our companies have really three or four priorities that they feel will make geothermal move forward, and I will briefly touch on those because they reflect on the tenor of the hearing.

The first is that to get more geothermal on-line, you have to address the initial issue that it is very expensive to build. A geothermal power plant costs about three times as much as a natural gas power plant to build. Now, the consumer price of power may be fairly close. Power plants today, greenfield plants, may come on-line from 5-1/2 cents to 7-1/2 cents, depending on the location. But the capital cost is, frankly, enormous. And private investors need to have the right stability, the right incentives, to do that.

One of the things we are looking at is whether the production tax credit should be extended across all renewables, and not just for the wind program. We discussed that with the Vice President's task force and others, and that is at least being considered.

But financing is obviously a part. The price of energy today helps, but as we all know, that is a very volatile thing. As gas exploration moves forward that may not be, where it is today, in a couple more years. You need to know you have stability and you can pay for the investment you can make up front.

The second issue which my companies have set as their priority, that fits right into this subcommittee, is public land: issues of access to the public land, issues of permitting on the public land. And you will hear a little bit from Calpine Corporation on sort of what became the poster child of how not to do geothermal power plant development at Medicine Lake in northern California.

And thirdly, our companies look at the need for continued research. We are still learning how to do this. We are still learning how to tap the heat of the earth, and do it right, and do it economically. We do not produce "widgets." It is not one power plant. It is learning how to use this resource; and research on not just how to reduce costs, but how to move into areas and produce power where we have never been able to do it before. So it is very important for us that research into the whole range of technologies continues.

I wanted to elaborate in response to some of the issues or the basic question that was framed as: What do we know about the resource? In my testimony, I pointed out something which I want you to note about the Geological Survey's testimony. The last assessment was produced in 1978. The theory of plate tectonics was not accepted until the late 70's, so most of the work they did was done even prior to our existing accepted geologic theories.

There has not been really much of a resource assessment program in geothermal energy. In resource assessment for oil, we have got ring maps all over the country. But resource assessment for geothermal energy has, frankly, not been seriously funded in over 20 years.

I want to note, land use is an issue. There may not be specific issues with respect to permitting, but as you will see with Medicine Lake where it takes over 20 years to get some kind of a decision on the first power plant, not in a remote, unknown area, but in a known geothermal resource area—like issuing a lease on a known oil field, where it takes you 20 years to finally develop it—this sent shock waves through our industry. And they said, "If you cannot develop there, where are you going to be able to develop?"

Do you want to talk financing? You can give this industry all the financial incentives you want to; but if it takes you that long from the plan to get it up and running, to get final decisions from government agencies, the financial incentives simply will not count. So that is why we think that is something that we are very, very glad this committee is paying attention to; the idea that we face the same kinds of problems as the gas industry, the same that all the renewable industries face in dealing with the public lands.

And then lastly, I want to respond to Mr. Kind's question about: Have we met with the Vice President's task force? I met with the Vice President's task force with a group of trade association representatives from the renewable industry. I can tell you that top on our list, in terms of things they could do to help bring more supplies on, was the extension of the renewable production tax credit to all of the renewable technologies.

But also on that list—and this was a cross-cutting list for the renewable industries—was the issue of permitting and leasing on public lands. Because the biomass industry, the geothermal industry, the hydropower industry, and you could add the wind industry, face the same kinds of difficulties when you have to suddenly get off of private domain and deal with public lands. And if you need energy in the West, public land is going to be a large part of your solution. Thank you.

[The prepared statement of Mr. Karl Gawell follows:]

Statement of Karl Gawell, Executive Director, Geothermal Energy Association

Honorable Chairwoman and Members of the Subcommittee, thank you for the opportunity to present the views of members of the Geothermal Energy Association to this Subcommittee regarding the potential of geothermal energy on public lands and theobstacles to developing this important national energy resource. GEA is the trade association that represents 83 companies and organizations involved in the U.S. geothermal industry, from power plant owners and operators to small drilling and exploration companies.

As you may know, GEA wrote Vice President Cheney last month urging him to include in his upcoming Task Force Report recognition of the problems facing geothermal energy on public lands. This Subcommittee and the Task Force have been told similar stories before not just from the fossil fuel industries, but from the other major renewable industries as well. Both the National Hydropower Association and the biomass industry have testified before the House Resources Committee earlier this year.

Hydropower and biomass are the top two renewable energy producers, and geothermal is the third. For all three, federal land management and regulatory agencies present substantial hurdles to their growth in the United States. Since I work regularly with members of the hydropower and biomass industries, I know that they share our exasperation with what sometimes are literally endless bureaucratic processes.

Geothermal Energy

Geothermal energy provides a significant amount of the energy and electricity consumed in the Western U.S. Geothermal heat provides energy for direct uses in commercial, industrial and residential settings in 26 states. Geothermal resources provide substantial electricity in California, Nevada, Utah and Hawaii. Expanded use of these resources will provide clean, reliable energy to the West. Thousands of megawatts of new geothermal power, and an equal amount of direct use energy, could be developed in the immediate future; however, obstacles created by public land agencies must be removed.

Beyond its energy contribution, geothermal production contributes directly to state and local economies and to the national Treasury. To date, geothermal electricity producers have paid over $600 million in rentals, bonus bids and royalties to the federal government. Moreover, according to an analysis performed by Prince-

ton Economic Research, it would be reasonable to estimate that the geothermal industry has paid nearly 6 times that amount in federal income tax, for a combined total of over $4 billion.[1] If the economic multiplier effects were considered, the total benefits of geothermal energy to the local and national economy would be substantially greater.

What is the future potential for geothermal energy on public lands? What would the benefits of developing these resources be? These are difficult questions to answer, in part because the federal efforts of the U.S. Geological Survey and the Department of Energy to define the U.S. resource base have not been funded for many years. To be reasonably accurate, for geothermal energy a "resource assessment" would involve not only analysis but also surface exploration, selected drilling and updated modeling. While individual companies have conducted some exploration, much of that data is proprietary and since the collapse of power markets in the early 90s there has been little interest in high-risk investment.

It is my understanding that the USGS and DOE will also testify today, so I will leave a discussion of previous estimates to them. However, I did participate in the workshop sessions that produced the current DOE Strategic Plan—an effort that brought together many of the leading experts from industry, the laboratories, and academia. There was a consensus then that with market support as much as 10,000 MW of electric capacity could be brought on-line in the West by 2010.[2] Assuming that goal could be reached, the Princeton Economic Research study defines some of the direct economic benefits. The cumulative federal royalties from the new geothermal plants would reach over $7 billion by 2050, and estimated income tax revenues would exceed $52 billion in nominal dollars.[3] For just royalties, alone, that would mean an investment of $3.5 billion in schools and local government facilities in the Western states through their share of federal royalties.

But, whether and when the economic benefits of further geothermal development are realized will greatly depend upon the action, or inaction, of the federal land management agencies. Today, about 75% of U.S. geothermal electricity production takes place on Federal public lands because that is where most of the resource is located. We expect that the resources yet to be developed also will be predominantly located on public lands. While the previous Administration espoused development of more geothermal resources in the West through its "GeoPowering the West" initiative, too little was done to address the underlying problems that prevent investment in geothermal projects on public lands.

New geothermal development requires the timely and reasonable administration of federal leasing, permitting, and environmental reviews by public land management agencies. Unfortunately, the recent past has been one characterized by bureaucratic delay and indecision by public land agencies; as a result, there has been a rapid decline in new geothermal energy development. Tens of thousands of acres of geothermal leases have been applied for in the West, but no action has been taken by federal agencies for years. Permit applications that should have taken days or weeks have taken months or years to process. Environmental reviews have been unnecessarily extensive, costly, and repetitive; and in areas where an EIS has been completed, decisions by federal agencies have been subject to years of delay and appeal.

Modoc and Klamath National Forest Geothermal Development

For the geothermal industry, the events surrounding development in California's Modoc and Klamath National Forests have been a chilling demonstration of why no sensible company would want to do business on public lands.

These National Forests hold one of the largest undeveloped Known Geothermal Resource Areas in the United States. The KGRA was identified shortly after the enactment of the Geothermal Steam Act of 1970. By April 1981, the U.S. Forest Service had completed an environmental assessment for geothermal leasing in the area, and the first competitive lease sale was held in February of 1982. High bids totaling $6.6 million were received for 11 leases. Additional lease sales were held in 1983 and 1988, bringing the total bids received to roughly $12 million.[4]

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[1] Princeton Economic Research, Inc., Review of Federal Geothermal Royalties and Taxes, December 15, 1998. (Figures expressed in 1998 dollars.)

[2] U.S. Department of Energy, Office of Geothermal Technologies, Strategic Plan for the Geothermal Energy Program, June 1998, page 21.

[3] Princeton Energy Research Inc, Op. Cit., Volume I, page 17.

[4] U.S. Department of the Interior and U.S. Department of Agriculture, Telephone Flat Geothermal Development Project Environmental Impact Statement Environmental Impact Report, Final, February 1999. Pages 1–1 through 1–7 review the history of leasing in the Medicine Lake Highlands.

After environmental reviews and some exploratory drilling, Calpine Corporation submitted the first plan of operations for construction of a power plant in 1996. Shortly afterward CalEnergy Corporation submitted its plan of operations for the Telephone Flat Geothermal Development Project.

If both of these projects had gone forward as originally conceived, today there would be 100MW of high reliability power on-line serving the needs of California and the Pacific Northwest. These plants would have been located at a very strategic point in the grid, adding significant reliability benefits. Not only would they have helped reduce the extent of some of the rolling black outs, but they would have saved Californians $10 million or more last year alone, assuming both would have produced at the BPA contract rate.

But instead, neither plant is operating. The Forest Service and BLM have rejected one, and the other languishes in the indeterminate review processes of the Interior Board of Land Appeals (IBLA).

For the Calpine project an extensive Environmental Impact Statement was finalized on September 25, 1998. However, it was not until May 31, 2000—eighteen months after issuing the final EIS—that a Record of Decision was issued to approve the Calpine Project—and then only after imposing through the ROD some of the most restrictive conditions ever imposed upon an energy project on public lands.

The CalEnergy EIS was issued as a final document on February 25, 1999. Some fifteen months later, also on May 31, 2000, the agencies issued a Record of Decision to pursue the "no action alternative" or, in other words, to reject geothermal development. The Record of Decision states that the agencies found that "cultural and social values" outweigh geothermal's contribution—a conclusion with which we strongly disagree.

But it doesn't end here, with one project approved and one denied. For CalEnergy is seeking compensation through the judicial system for their years of investment and work on the Telephone Flat Project. Instead of reaping royalties and income taxes from power production, the government may be paying millions to CalEnergy for not producing energy.

For Calpine, the saga simply continues. After the ROD was issued, it was appealed to the Interior Board of Land Appeals where, given the backlog of appeals, a decision is expected perhaps sometime next year! Meanwhile, further exploratory drilling was blocked pending a decision on the appeal. Only recently has the IBLA judge ruled that his stay should not have been interpreted as applying to the exploratory drilling that had already been approved by BLM

Setting aside the substantive issues involved in the denial of the CalEnergy Project, or the onerous mitigation imposed on the Calpine proposal, the years of delay and uncertainty have sent shock waves through the geothermal industry. This area had for decades been proposed for geothermal development. Land use plans and environmental assessments supported geothermal development as an appropriate and publicly beneficial use. Potential development was well recognized, and dozens of different meetings, environmental reviews, and other opportunities for public input preceded any project proposal.

Yet, despite this favorable setting, it has taken nearly twenty years from the first competitive lease sale to reach a decision on the first small power plant project—and we're still not sure what that decision is. As a result, the lesson most widely learned from the Fourmile Hill example is that a new geothermal project cannot be approved without years of arduous and expensive bureaucratic processing.

This has had a chilling effect on the geothermal industry. If this is what can be expected, few, if any, companies will attempt to develop new geothermal projects on public lands in the West, particularly when they involve joint BLM–Forest Service jurisdiction. Regardless of whatever market or financial incentives may be offered for new clean, power production, they will not be enough to overcome the costs imposed by such an arduous process and potentially decades of delay. It will simply be too much for any private investor to bear.

Recommendations

It is important that the Subcommittee recognize that there are serious problems facing geothermal energy development on the public lands. In many ways, the problems facing natural gas development are mirrored for geothermal development, if not exacerbated by geothermal energy's higher risk and much higher capital costs.

To mitigate these extraordinary delays and costs, we would encourage the federal land management and regulatory agencies to:

- Ensure that the processing of needed, clean energy projects on public lands are handled with a sense of urgency and priority. It is vital that bureaucratic delays be reduced from years to months if not weeks.

- Eliminate repetition and duplication in the process. The Calpine proposal was held up repeatedly while the same issues were examined over and over again by different federal and state agencies.
- Strike a more responsible balance between our need for new, clean energy supplies and other uses and values for the public lands.
- Ensure reasonable access to public lands, including military lands, and lease terms that reflect the public interest in developing geothermal energy resources.

And, while you are moving forward on these programmatic and policy initiatives, please don't forget the Fourmile Hill geothermal project itself. It is still trapped in the federal bureaucracy. Prompt action to set this project on the path to completion would be a welcome signal to all of the geothermal industry that there is a new, positive direction in public land management.

To those concerned about the alleged impact of geothermal development, let me assure you that while the Medicine Lake Highlands is a beautiful area, this development will not jeopardize its character. To begin with, the area is not "pristine." It is largely second growth timber and there is a wide-ranging network of roads. The development plan approved by the Forest Service requires the company to use the existing roads whenever possible, and as a result less than one-mile of new roadway will be built.

The area also has developed recreational sites, such as Medicine Lake's boat ramp, picnic area, and RV parking spaces. These uses will not be displaced. The power plant will not be visible from the lake, and boaters will not hear it operating since mitigation measures require it to be quieter than the rustling of leaves. It will not impact the quality of the water in the Lake, nor will its presence prevent anyone from using the cultural area as they have in the past.

Regarding cultural conflicts, Calpine should be applauded for its efforts to work cooperatively with Native Americans in the region. Calpine, along with federal and state agencies, has met numerous times with area tribes to address their concerns. In fact, much of the information about their cultural and historic uses comes from a study funded by Calpine. Through the EIS and consultation process, the project has been designed to avoid any impact to known cultural or historical sites and any unexpected discoveries made during construction will be handled strictly in accordance with an agreement reached between Calpine and the Klamath–Modoc Tribe—the tribe that ceded these lands to the federal government by treaty in the 1800s. Calpine has also agreed to preferential hiring for tribal members from all of the tribes in the area.

The Chairman of the Klamath Tribes has stated on the record, "It is our position that this development is planned in a way that respects both our traditional culture and the surrounding forest. This geothermal development as proposed should benefit our region in many ways. [5] For many members of the Klamath–Modoc, Shasta, and Pit River tribes the opportunity for stable, well-paying jobs near their homes is a welcome development of significant benefit for their families and community.

If this project moves forward California and the West will benefit. It will be an important energy contributor; producing about as much electricity annually as the entire solar/photovoltaic industry does today nationwide. [6]

Conclusion

The present energy situation in the western U.S. presents an opportunity to increase energy diversity and energy security through the production of clean, indigenous, renewable power. This opportunity must not be squandered by bureaucratic red tape. We urge you to clear the logjam that prevents geothermal from contributing fully to our nation's energy security. The Geothermal Energy Association and its membership would enthusiastically support your efforts to achieve these ends.

Thank you.

Mrs. CUBIN. Thank you, Mr. Gawell.

The Chair now recognizes Mr. Pigott.

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[5] Bonneville Power Administration, Fourmile Hill Geothermal Development Project, Power Purchase and Transmission Service Agreements, November 2000, page 15.

[6] The Solar Energy Industries Association has estimated that the solar industry today (thermal and photovoltaic) produces 333 billion kWhrs annually. A 49.9MW geothermal power plant producing electricity at a 90% factor would generate 393 billion kWhrs annually.

STATEMENT OF JACK PIGOTT, ELECTRIC REGULATORY DIRECTOR, CALPINE CORPORATION

Mr. PIGOTT. Madam Chairwoman, members of the subcommittee, thank you for inviting me today to testify on geothermal development on public lands. I represent Calpine Corporation. We are a leading independent power producer. We are involved mostly in developing new gas generation, but we also happen to be the largest geothermal producer in the U.S., generating 800 megawatts at operations in the Geysers near Napa Valley, California.

Calpine has been attempting to develop a new geothermal project on our leases in Glass Mountain KGRA. We have about 20,000 acres of leases. And Glass Mountain is located in northern California, about 30 miles south of the Oregon border. It is thought to be one of the largest undeveloped geothermal resources, with a potential of perhaps 1,000 megawatts, which would be enough to power a city the size of San Francisco or Seattle.

Our development effort has experienced repeated delays and setbacks. Our Fourmile Hill project, which is about 50 megawatts, has been mired in the Federal permitting and appeal process for about 5 years.

A separate project developed by another company is now in litigation. And their project was also in the same resource area.

A timeline for the project is, basically, in the early and mid-1980's, the BLM and Forest Service encouraged geothermal development by holding competitive lease auctions. They collected millions of dollars from developers in bonus payments and lease payments.

In 1991, the Bonneville Power Administration had a program to encourage geothermal power development. And even at a time of low prices, they offered to buy the power from projects. And so in late 1994, Calpine acquired its lease position from other companies there. We started collecting the baseline data leading up to an environmental impact statement.

In 1996, we submitted an application to develop the first 50-megawatt project. This started a prolonged review that ultimately cost Calpine over $3 million. The final EIS was issued in October 1998, two and a half years later. The EIS found no adverse impacts that could not be mitigated, with the exception of an impact on Native American traditional cultural values in the area.

The agency then took 20 months to issue a record of decision on the project. And that is a process that typically could take 3 months or less. The record of decision focused on one particular area, which is the "caldera." Glass Mountain is a collapsed volcano. It is the caldera. And that was considered sensitive from the cultural values standpoint; but it also contains most of the geothermal resource. And since our project was outside of the caldera ring, it was approved. Since the other project was inside, it was rejected.

I would like to point out that inside the caldera, at the most sensitive spot for Native Americans, which is the lake, there already are cabins, motor boats, a boat ramp. The entire area had been logged at one time. And the lake itself is becoming eutrophic because of the septic systems from the cabins. So it is not wilderness.

One of the conditions of our record of decision was a 5-year moratorium on further geothermal development after the first 50

megawatts. And this conflicted with the lease rights that we purchased.

After the approval of the record of decision, opponents immediately appealed the project. The Forest Service denied its appeal in 45 days, but then the Interior Board of Land Appeals, which has a backlog of 18 months, was still considering it. And then on top of that, they issued a stay that stopped all of our activities.

Statistics to consider: The permitting process has so far taken 5 years. It is likely to take over six. The final EIS had 400 mitigation measures that we had to comply with. The administrative record for the permitting process takes up 90 bound volumes. All of which is for a 50-megawatt project.

If these projects had been permitted expeditiously, we would have 100 megawatts there to address California's energy crisis and the West's energy crisis, coming online this summer. If we had had a crystal ball, however, we never would have even started this, knowing how long it has taken.

My recommendations would be that Federal agencies establish and stick to time frames and milestones for completing reviews and making their decisions; that NEPA reviews conducted prior to leasing should establish whether geothermal is going to be allowable in an area; and that NEPA reviews afterwards just determine how it is going to be done, rather than revisiting the "whether they should be done" decision.

The IBLA backlog should be eliminated as soon as possible. There is no reason why the Forest Service can make their decision in a matter of weeks, and the IBLA takes 18 months.

And we would like Congress to ask the Administration to eliminate the moratorium at Glass Mountain and to act broadly to help expedite the permitting process and facilitate geothermal development. Thank you.

[The prepared statement of Mr. Jack Pigott follows:]

Statement of Jack Pigott, Electric Regulatory Director, Calpine Corporation

Madam Chairwoman, members of the Subcommittee, I appreciate the opportunity to testify before you today on the challenges facing the development of geothermal energy on public lands.

By way of introduction, Calpine is the leading independent power producer in the U.S. and the largest producer of geothermal energy in the U.S. Calpine has over 32,000 megawatts (MW) of electric generating capacity either in existing operation, under construction, or announced for development, in 28 states and Canada. Calpine is engaged in the largest construction program in the history of the power industry, with about 14,000 megawatts under construction today.

Calpine is focused on two key technologies: combined-cycle natural gas-fired generation and geothermal steam generation. Gas-fired power plants represent the fastest growing segment of the U.S. power industry, and are the main focus of Calpine's efforts. These efficient, state -of-the-art plants are a low-cost and clean-burning source of electricity for today's competitive market. Geothermal energy is an important niche market for Calpine. Calpine's main geothermal facility is the Geysers, located near Napa Valley, CA, producing about 800 MW of electricity.

I come here today to tell you about Calpine's efforts to develop a known geothermal resource area in Northern California, and particularly to discuss the repeated delays and setbacks that we have experienced regarding that project. I tell you this not because you should have sympathy for Calpine, but because our case is an example of the difficulties that all energy developers face, even as the need for additional generation becomes more and more pressing. Calpine's Fourmile Hill project has been mired in the Federal permitting and appeal process for approximately 5 years, while the separate Telephone Flat project in the same resource area

that was being developed by CalEnergy is presently the subject of a multi-million dollar takings and breach of contract lawsuit against the federal government.

My example is all the more ironic because it involves the development of clean, renewable energy. Despite the fact that renewables enjoy the widespread rhetorical support of public officials, this does not in any way immunize the development of individual renewables projects from the gauntlet of delays that plague more traditional generation projects.

The geothermal resource area to which I refer is called Glass Mountain. It lies in the Klamath and Modoc National Forests in northern California, approximately 30 miles south of the Oregon border. Glass Mountain is thought to be one of the largest undeveloped geothermal resources in the United States, with the potential of generating 1000 MW, more than is currently produced at the Geysers, and enough to meet the electricity needs of a city the size of San Francisco or Seattle.

In the early 1980s, the Bureau of Land Management (BLM) and the U.S. Forest Service actively sought the investment of private capital in developing the Glass Mountain geothermal resource by soliciting competitive bids to lease acreage for development. Specifically, the lessee was to acquire the right to develop and commercialize the underlying geothermal resource. This was done under the authority of the Geothermal Steam Act, which encourages the development of geothermal energy on federal lands. A historical timeline of the leasing and permitting activities for Glass Mountain is attached to this testimony.

Freeport McMoran was the successful bidder, and entered into geothermal leases covering over 20,000 acres. Prior to issuing the leases, the BLM and the Forest Service conducted an Environmental Assessment as required under the National Environmental Policy Act (NEPA). In 1994, Calpine acquired Freeport McMoran's lease position.

In 1991, the Bonneville Power Administration (BPA) took its own step toward encouraging the development of geothermal resources, effectively supplementing the encouragement offered by the Forest Service and BLM. BPA entered into memoranda of understanding and other agreements that provided incentives for Calpine to proceed with its development efforts. BPA's goal was to ensure that power from Glass Mountain would be available to serve customers in Northern California and the Northwest.

In short, Calpine was encouraged to develop a geothermal power project at Glass Mountain by three agencies of the U.S. government: the BLM, the Forest Service, and BPA.

FOURMILE HILL GEOTHERMAL PROJECT NEPA PROCESS

Through 1994 and 1995, Calpine collected baseline data, and in 1996, Calpine submitted to the BLM and Forest Service an application to develop the 49.9 MW Fourmile Hill project on its geothermal leases. This initiated a review under NEPA and its California counterpart (CEQA) that ultimately became a prolonged process that cost Calpine more than $3 million.

In addition to the usual elements of a NEPA/CEQA review, Calpine funded an extensive ethnographic study of the customs and historical uses of the Glass Mountain area by the region's Native American tribes. The BLM and Forest Service strongly recommended conducting the ethnographic study as a mitigation measure and goodwill gesture to the tribes. During the NEPA process, the lead agencies and/or the ethnographer met and consulted with the affected tribes at least 30 times.

The final Environmental Impact Statement (EIS) for the Fourmile Hill project was released on October 2, 1998. The EIS was extensive and thorough, much more so than would typically be the case for a 49.9 MW project, having taken almost 2.5 years to prepare. The EIS found that the project would have but one adverse effect that could not be mitigated. That adverse effect was on Native American traditional spiritual values with respect to noise and landscape views, and was based on representations of the tribes during preparation of the ethnographic study. The essence of the adverse effect finding is that the geothermal development would degrade the spiritual significance of Glass Mountain area as a sacred site.

In order to address the Native American concerns regarding the project, Calpine met with the three tribes identified in the ethnographic study as having historically used the Glass Mountain area. We ultimately entered into agreements with two of the tribes and part of the third tribe. However, the remaining bands of the third tribe continue to be opposed to the project.

It should be pointed out that the Glass Mountain area already contains paved roads, a campground, cabins, a boat ramp, motor boats, a snowmobile park, and an active pumice mine. At one time, the entire area was logged. Furthermore, the area has very few archaeological sites, due largely to the fact that it is at a high elevation and under as much as 20 feet of snow for 6 months of the year.

CONSULTATIONS BETWEEN THE LEAD AGENCIES AND SHPO

As a result of the adverse effect determination, the BLM and the Forest Service decided to consult with the California State Historic Preservation Office (SHPO) and the federal Advisory Council on Historic Preservation prior to issuing a Record of Decision (ROD) on Calpine's project. Unfortunately, SHPO and the Advisory Council had no incentive to close consultations in a timely fashion, and BLM and Forest Service did little to push the process along.

In a letter of February 26, 1999 to Senator Dianne Feinstein, the Forest Service estimated that the consultations would be completed and the ROD issued by mid–April 1999. The agencies missed that target date, and then went on to promise a series of later dates, only to fail to meet each of them. Whenever we asked the Forest Service and the BLM for a target date, the answer was typically "in two months," until we joked that the agencies used a rolling two-month deadline. Finally, after considerable pressure from members of Congress and others, the agencies issued their ROD approving the project on May 31, 2000, almost 20 months after completion of the final EIS.

The ROD focused on the volcanic "caldera," a feature encompassing about twenty-four square miles in the Glass Mountain known geothermal resource area, which was deemed the most sensitive area from a traditional cultural values standpoint, but which also contains the majority of the prospective geothermal resource. Calpine's Fourmile Hill project was approved because it happens to lie outside of the caldera. A separate project that was also proceeding through the permitting process, the CalEnergy Telephone Flat geothermal project, was denied because it was located within the caldera. Furthermore, the BLM imposed a moratorium on any further geothermal development in the entire Glass Mountain area for a minimum of five years, excepting only the Fourmile Hill 49.9 MW project.

The agencies" failure to issue the ROD in a timely manner seems to have been the result of at least two factors. First, the agencies seemed uncertain as to how to handle its consultation with SHPO and the Advisory Council. Second, the Forest Service specifically delayed making a decision while it reviewed its policies with respect to geothermal resource development. In Calpine's view, such a review should have occurred before the leases were issued, not after a lessee has invested millions of dollars in the permitting process.

Finally, the moratorium by the BLM and Forest Service on further development at Glass Mountain except for the Fourmile Hill project is entirely inconsistent with the existing lease rights, and with prior decisions and actions by these agencies that authorized and encouraged geothermal development in the area.

THE APPEAL PROCESS

After the ROD approving Calpine's project was issued, project opponents predictably appealed. The Forest Service promptly ruled on the appeal of its decision on September 1, 2000 denying the appeal. However, the Interior Board of Land Appeals (IBLA), which rules on appeals of BLM decisions, presently has an 18-month backlog of cases. Project opponents requested a stay of ground moving activities pending the outcome of the appeal, and the IBLA granted the stay.

Therefore, it appears that the permitting process for this project will take a total of 6 years or more. Furthermore, if the IBLA ultimately denies the appeals, the project opponents have the option of seeking time-consuming review in federal court.

The following are some statistics that I wanted to bring to your attention:

- The permitting process has taken 5 years, and is likely to consume 6 years or more;
- The Final EIS for the Fourmile Hill project provides for over 400 different mitigation measures that the project must comply with; and
- The administrative record for the permitting process takes up 90 bound volumes.

In closing, let me make an observation and a few recommendations:

First, the observation. Had the permitting process moved expeditiously, both the Fourmile Hill project and the Telephone Flat project would be entering into commercial operation this year, providing 100 MW of low cost, clean renewable power to address the western states" electricity crisis. However, if Calpine knew in 1994 what it knows now, it is safe to say that it never would have invested its time and capital in the Fourmile Hill project. Similarly, unless the situation changes, Calpine is unlikely to embark on a similar project ever again. This should concern this Subcommittee because many of the geothermal resources in the United States are located on federal land. As long as the federal permitting process remains as time-consuming and costly as what Calpine has experienced, private companies will be severely discouraged from developing these energy resources.

My first recommendation is that resource agencies such as the BLM and Forest Service need to understand that their protracted review processes discourage the very sort of development that Congress intended in the Geothermal Steam Act. We are certainly not recommending that such reviews be done hastily or shoddily, but they must be done expeditiously if we are to increase production of much-needed electricity from geothermal and other energy resources located on Federal land. Timeframes and milestones should be established for all of the Federal and State agencies involved to complete environmental reviews and make decisions.

Second, Calpine recommends that Congress take steps to eliminate the IBLA appeal backlog as soon as possible. There is no logical reason why the Forest Service can decide appeals in a matter of weeks, while the IBLA takes 18 months or more.

Finally, Congress should ask the new Administration to take steps to end the discouragement of geothermal development on federal lands. There is no need or other basis for the current five year moratorium at Glass Mountain. We suggest that the Secretaries and, if necessary, Congress act broadly to direct renewed support for environmentally sound production of geothermal energy at Glass Mountain and other areas, facilitated by timely and fair review by all involved agencies.

I would be pleased to answer any questions.

[An attachment to Mr. Pigott's statement follows:]

Historical Timeline - Glass Mountain Known Geothermal Resource Area (KGRA)

- **December 24, 1970** - 15,371 acre Glass Mountain designated by USGS as Known Geothermal Resource Area (KGRA)
- **January 1, 1974** - 17,916 acres added to the Glass Mountain KGRA by BLM consistent with new Geothermal Steam Act regulations (43 CFR 3200)
- **April 1981** - USFS issues final Environmental Assessment for geothermal leasing in the Glass Mountain area
- **January 1982** - first noncompetitive leases issued for the Glass Mountain Area
- **February 18, 1982** - first competitive lease sale for the Glass Mountain Area results in the issuance of 11 leases covering 25,437 acres. (High bids total $6.6 million)
- **March 1983** - second competitive lease sale results in the issuance of 4 additional leases covering 7,029 acres (High bids total about $1 million)
- **August 3, 1983** - 100,918 acres added to Glass Mountain KGRA by BLM
- **Late 1984** - joint BLM/USFS Supplemental Environmental Assessment prepared covering development and utilization of 161,000 acres
- **April 1988** - third competitive lease sale. High bids totaling more than $3 million were received on 12 parcels totaling 22,918 acres
- **1991** - Based upon deep test exploration wells at pad 31-17, "the BLM determined that the well was capable of producing 'unitized substances' in paying quantities (i.e., the well was capable of producing geothermal fluid in sufficient quantity and with the necessary characteristics for commercial use."
- **Since 1991** - two plans of operation for deep test wells have been submitted, addressed in two separate EA's and both have been approved but no drilling has yet occurred.
- **1996** - Calpine Corporation submitted a Plan of Operations to the BLM for construction of a 49.9 MW geothermal power plant (Fourmile Hill)
- **February 1997** - CalEnergy Corporation submitted a Plan of Operations to the BLM for construction of a 48 MW geothermal power plant (Telephone Flat)
- **September 25, 1998** - Final EIS completed for Fourmile Hill Geothermal Development Project
- **February 25, 1999** - Final EIS Completed for Telephone Flat Geothermal Development Project
- **May 31, 2000** - Lead Agencies issue Records of Decision (ROD) approving the Fourmile Hill Geothermal Development Project and rejecting the Telephone Flat Geothermal Project
- **June 2000** - Appeals are filed by project opponents to overturn the Fourmile Hill ROD
- **September 2000** - USFS rejects all appeals and upholds ROD, while the Interior Board of Land Appeals issues a stay on earthmoving activities until it decides the appeal (typically 18 - 24 months in the future)

Mrs. CUBIN. Thank you very much, Mr. Pigott.

The Chair now recognizes Mr. Ain.

STATEMENT OF ROSS D. AIN, SENIOR VICE PRESIDENT, CAITHNESS ENERGY LLC; ACCOMPANIED BY KENNETH HOFFMAN

Mr. AIN. Thank you very much, Madam Chairwoman and members of the subcommittee, for this opportunity to present the views of Caithness Energy regarding the challenges and opportunities involved in the development of geothermal energy on public lands.

Caithness is one of the largest independent power producers utilizing renewable resources. We operate over 465 megawatts of geothermal; 160 megawatts of solar, the two largest solar plants in the world; and 210 megawatts of wind projects. We have other gas-fired projects in operation, and over 1,000 megawatts of new projects in both California and Arizona that are under active development. We are also at the present time the largest geothermal producer in the State of Nevada, with 85 megawatts in Nevada.

We have a rather unique perspective on geothermal development on public lands because we have approximately 243 megawatts on lands leased from BLM, 180 megawatts on lands leased from the United States Naval Air Weapons Center at China Lake, and approximately 42 megawatts on private land. So we are a pretty good example of how to deal with different kinds of leasing arrangements, royalty structures, and get them on to development.

Geothermal resources in the West are found within the vast expanse of all federally controlled land. These resources underlie not only land controlled by the BLM, but also, as our experience demonstrates, lands controlled by the Department of Defense through its various departments and agencies. And we believe that both types of land should be open for active development, consistent of course with the military mission of the land reserved by the Department of Defense.

We have three principal recommendations we respectfully suggest that the subcommittee consider with regard to geothermal development on land subject to military reservation: One, uniform policies on securing and maintaining the leasehold estate, except as dictated by military needs, of course; uniform royalty structures; and centralized administration of the lease and royalty programs.

Other witnesses testified to the difficulty of permitting new geothermal energy projects. We certainly have had our share of that. But reducing unnecessary barriers to entry is one critical element in the exploitation of this clean domestic resource. And we believe that if we follow these three recommendations there would be more geothermal development on public lands because we would remove a number of the uncertainties, reduce risk, and reduce delay.

With regard to uniform policies on securing and maintaining leases, BLM's policies provide for competitive and non-competitive leasing. The 1998 legislative amendment to the Steam Act provides for lease tenure by production. These policies work well to encourage investment on non-military Federal lands. Together, these would give some certainty to those interested in development, and security in the knowledge that if you produce you can stay.

Policies on land administered by the Department of Defense is far less clear. In our case at Coso, for example, the lease has fixed terms, with renewals at the Navy's discretion; which is obviously a great disincentive for further development of the geothermal resource at these sites.

With regard to the royalty payment structure, Congress passed the Geothermal Steam Act, which provides for royalty payment levels deemed appropriate for both the United States and for developers. The industry supported the adoption of the Federal royalty regulations in 1992 governing BLM leases because prior to that there was no consistency in royalty administration, and that itself was discouraging investment in geothermal energy. There does not appear to be any valid interests that we know of in allowing case-by-case negotiation of royalties on military lands, as has occurred with our projects at China Lake. It creates greater uncertainty, risk, higher costs—all of which retard geothermal development.

In fact, we pay about two and a half times the royalties at China Lake that we pay on BLM land. We have been asked, in fact, to look at land in Nevada on a Navy reserve. But we have not done so because of the difficulty in determining what we would have to pay and the lease term arrangements.

In fact, rather than paying more for royalties on military reservations, I submit to you that we should pay less, because of the additional difficulties and costs in developing, operating, and maintaining projects within the constraints appropriately imposed by military authorities both to protect project personnel and their primary military missions. And I have given some examples in my testimony of the kind of things that we have to do to operate on military reserves, which we don't have to do operating on BLM lands.

And finally, I go in my testimony into the administration of the leases and royalty payments. It seems to us we could save a great deal of Federal Government money by consolidating that function with people who do the same thing as far as BLM land.

Thank you very much for this opportunity to testify. I have with me Kenneth Hoffman, who is in charge of all of our project operations for Caithness in California and Nevada. And we are both available to answer questions for the committee.

[The prepared statement of Mr. Ross D. Ain follows:]

Statement of Ross D. Ain, Senior Vice President, Caithness Energy LLC

Honorable Chairwoman, Members of the Subcommittee, thank you for this opportunity to present the views of Caithness Energy, LLC, regarding the challenges and opportunities involved in the development of geothermal energy on public lands.

Caithness Energy, LLC, is one of the Nation's largest independent power producers utilizing renewable resources for power production. Our operating renewable energy portfolio includes over 465 MW's of geothermal projects, 160 MW's of solar projects and 210 MW's of wind projects. Non-renewable projects include 315 MW's of gas-turbine projects in operation and over one thousand additional megawatts of generation at varying stages of development.

In the early 1980s, with increased awareness of environmental issues, Caithness made the decision to utilize its experience in resource exploration to enter the geothermal power industry. For nearly a decade, we concentrated our efforts almost exclusively on the development of three geothermal projects: the 270 MW's Coso Geothermal Project in California, and the 25 MW's Dixie Valley and 12.5 MW's Steamboat Geothermal Projects both in Nevada. Since that time, Caithness has acquired additional geothermal interests in California and Nevada.

Caithness has a unique perspective on geothermal development on public lands because we have approximately 243 MW's of our production on lands leased from BLM, 180 MW's of production from lands at the United States Naval Air Weapons Center at China Lake, California and approximately 42 MW's located on private land.

As can be attested by the other experts today, geothermal resources in the Western United States are found within the vast expanse of Federally-controlled land. These resources underline not only land controlled by the Bureau of Land Management, but as our experience demonstrates, they are also found on lands controlled by the Department of Defense through its various departments and agencies. In order to maximize the production of energy from geothermal resources, both types of land should be open to development.

We certainly recognize that energy resources within military reservations should be developed only in a manner fully consistent with their primary function and military mission. That being said, we believe that greater uniformity of policy and administration of both types of land would, consistent with military uses, greatly enhance opportunities of geothermal power development.

There are three principal recommendations we would respectfully suggest that the Subcommittee consider with regard to geothermal development on land subject to military reservation:

(1) Uniform policies on securing and maintaining the leasehold estate, except as dictated by military needs.

(2) Uniform royalty structures.

(3) Centralized administration of the lease and royalty programs.

Other witnesses have testified to the difficulty in permitting new geothermal energy projects. Reducing unnecessary barriers to entry is one critical element to the successful exploitation of this clean domestic resource. The three policies mentioned above will greatly assist in reducing risks, speeding up development and eliminating unnecessary administrative costs both to developers and the Federal government. It would provide for a uniform royalty payment schedule that will fairly compensate the United States while giving developers a known cost factor to incorporate into their financial calculations, reducing risk, uncertainty and delays.

With regard to uniform policies on securing and maintaining leases for geothermal development, the BLM policies provide for competitive and non-competitive leasing. The 1988 legislative amendment to the Steam Act provides for lease tenure by production. These policies work well to encourage investment on non-military Federal lands. Together these give some certainty to those interested in development, and security in the knowledge that if you produce you can stay. Policies on land administered by the Department of Defense are far less clear. In our case at Coso, for example, the lease has fixed terms with renewals at the Navy's discretion, which is a disincentive for further development of these lands.

With regard to royalty payment structure, the Congress passed the Geothermal Steam Act that provides for royalty payment levels determined appropriate for both the United States and the developers. The industry supported the adoption of federal royalty regulations in 1992 governing BLM leases because, prior to that, there was no consistency in royalty administration, and that was discouraging investment in geothermal energy. There does not appear to be any valid Federal interest in allowing case by case negotiation of royalties on military lands, as has occurred with our projects at China Lake. It creates greater uncertainty, risk, higher costs, all of which retard geothermal development.

In fact, rather than paying more in royalties on military reservations, developers should probably pay less in royalties because of the additional difficulties and costs in developing, operating and maintaining projects within the constraints appropriately imposed by the military authorities both to protect project personnel and primary military mission. Examples of these additional costs are additional security procedures, off-site control rooms, additional restrictions on opportunities for scheduled maintenance when contrasted with facilities on BLM leases, and other configuration costs such as transmission line restrictions. Operating on military reservations clearly involve higher capital and operating costs. Paying higher royalties than otherwise applicable on BLM lands is not consistent with optimizing the development of this resource and other Congressionally determined policies.

Finally, administration of the leases and royalty payments should be consolidated into one entity to lower costs and promote uniform application of Federal policies. It seems to us that MMS should be that entity. That is not to say that mission critical concerns on military reservations should be ignored. Quite the contrary, geothermal development should only be allowed if consistent with the military purposes of the reservation and only in accordance with safe and secure procedures. However,

once permitted to occur the level of, and administration of, royalty payments should be uniform and consolidated within one Federal agency.

In summary, we believe that there are untapped geothermal resources available in the Western United States on land held by the Department of Defense and these resources can be developed in a manner fully consistent with the primary military function of those reservations. To facilitate such development, we would recommend that the Congress consider the consolidation of the administration of those leases under the BLM and conform leasing and royalty payment policies to those presently required by the BLM, subject to consistency with military mission. We think these changes would encourage greater geothermal development of Federal land, reduce federal cost of administration, and provide appropriate level of royalty payments consistent with Congress' determination under the Geothermal Steam Act.

Thank you.

Mrs. CUBIN. Thank you very much for your testimony.

I have to start by saying that I am quite disappointed in my Democrat colleagues, their not being here for this hearing; other than Mrs. Napolitano who was here and obviously has had surgery and did not feel up to staying for the whole hearing.

I hear over and over how we have to have renewable resources as part of the picture. And I agree that we have to have conservation. But when it comes time to hear the real story, what it is really like to be in the energy business, it appears that they are not interested.

So in my mind, they are not interested in reality. They do not want to drill for more oil. They do not want to open up the public lands. They do not want to mine more coal. They do not want uranium. They want renewables, but they do not want to hear about them. And it is very frustrating dealing with that mindset.

Those of us who are from the West are the ones that live with some of these issues. And unfortunately, most of my colleagues do not understand because, number one, they do not live with it and, number two, they do not come to learn about it.

So having said that, Mr. Gawell, you made a statement that I found interesting and did not exactly understand it. What did you mean when you said that there is no consistency in the royalties with geothermal? You paid three and a half times on the naval base what is regular, 10 to 15 percent? Explain that lack of consistency.

Or, excuse me. Mr. Ain, you were the one that brought that up.

Mr. AIN. Right.

Mr. HOFFMAN. It is basically because with the Navy it was negotiated. It is a unique contract that, to my knowledge, is the only operating geothermal plant that is on a military facility in the country. So it had a whole different initiation.

But looking forward, if you will, we make decisions trying to expand our existing projects, because that is where you look first, is your existing projects. You have infrastructure, you know, so that is where you want to go. And we look at it and say, well, with these royalty rates that are there, unlike the BLM, 10 to 15 percent, it does not make sense for us to go forward with an expansion.

Mrs. CUBIN. Talk to me a little bit about the 10 to 15 percent royalty. Is that a disincentive to develop geothermal? I mean, obviously, it is. It is a cost. But is it out of line, I guess is the question I would like to ask.

Mr. HOFFMAN. I would not say it is out of line. The only comment I would say is the calculation: You know, it is not as easy as "A" plus "B" equals "C." And so the problem we get into is the interpretation of that calculation. And we have had multiple issues with the MMS and those calculations.

So it would sure be nice to be able to understand what the formula is, and be able to calculate the number and deal with it that way. Unfortunately, it is not like that. You are up to various auditors, etcetera. You end up into having some various issues with that.

Mrs. CUBIN. So if we want to help spur geothermal development, would we need to help clarify the royalties more? We deal with this with almost every mineral, or have in the past. The evaluation has been the main problem—well, not main, but a huge problem. So I guess maybe that is something we need to look at and give more certainty to the people who want to invest their money, so that you can have a better sense of what your return on investment would be.

I wanted to ask Mr. Gawell, before my time runs out, did the Forest Service 60 million-acre wilderness initiative affect geothermal development?

Mr. GAWELL. Chairman Cubin, absolutely. Not only did it affect specifically the project that CalEnergy was trying to develop at Medicine Lake, because it involved the Modoc wilderness area—And by the way, ironically, it affected it because there was just complete uncertainty as to whether they could put a small segment of transmission line across part of that area. And when the draft rules came out, the draft rules would have allowed CalEnergy to do that. But by the time that those rules came out, that project was basically collapsing at that point because it had taken so long.

And in the Northwest, what we have seen is simply no leases being issued. My understanding from the Endroad Workshop is that they had both Forest Service people and others from the region; and that there over the last 10 years something in the range of 100,000 acres of lease applications have been applied for in the Northwest that no action was ever taken on, because the Forest Service would take no action, given all the uncertainty over the various issues in the Northwest. And most of those simply have gone away, because you do not wait for 10 years to find out whether the Government is going to respond to you or not.

Mrs. CUBIN. Just a question about the process that the Government used in issuing that policy. Did the Forest Service get in touch with your association members prior to putting forth this policy?

Mr. GAWELL. We knew about it. To my knowledge, the Forest Service never asked us specifically to comment.

Mrs. CUBIN. So as far as scoping was concerned, your industry just did not know of any information that the Forest Service had from outside sources?

Mr. GAWELL. I am not aware of any assessment by the Forest Service of the relationship of that policy on geothermal energy in the Northwest. If you look at the maps of geothermal energy, the resource runs through California and right up through Oregon and Washington. And there should be substantial resource there. There

have been some attempts to develop it, but I am not sure that they have ever assessed how those two overlap.

The reaction I get from companies involved in it has been a substantial setback. And simply, nobody is going to go forward with development in the national forest system in the Northwest, given the uncertainty we face. And frankly, the south end of that whole area is northern California, which is where Fourmile Hill project is located.

Mrs. CUBIN. Thank you very much.

The Chair now recognizes Mr. Gibbons.

Mr. GIBBONS. Madam Chairman, thank you. And I thank the panel. It is a pleasure to have you before us. I am well aware of your geothermal projects in Dixie Valley and Steamboat Springs in Nevada, and appreciate the effort you have gone to with your company to make sure that the energy needs of our nation are met.

I guess one of the things that strikes me as unique—and Mr. Gawell, maybe you can talk to me about this—why is it that a geothermal plant requires three times as much in terms of cost development than a gas-fired electrical plant?

Is it technology, or is it the permitting process? Is it the time required to get it on-line? What is driving that cost difference?

Mr. GAWELL. Essentially, when you build a geothermal plant, you are doing the whole series of actions you would take, for example, if you built a gas plant. But track it all the way back to the gas field. You are doing them all on site.

For example, roughly 40 percent of the cost of greenfield development is reservoir definition. Essentially, what you might do at a natural gas field in Wyoming, or to power a plant in Nevada or somewhere else, you are compressing that all into that single unit.

Mr. GIBBONS. Okay.

Mr. GAWELL. So there is a tremendous cost involved in the plant. It also is more capital intensive because of the number of wells, the cost of the wells, etcetera—and you may want to comment more specifically—than, again, a simple gas plant would be.

Mr. GIBBONS. Give us a broad perspective of how much of the total U.S. energy demand geothermal can meet. Just give me a rough percentage.

Mr. GAWELL. Today we are about one-half of 1 percent, total. Our estimates say we could probably achieve, with roughly current technology, maybe 6 to 8 percent.

Mr. GIBBONS. Okay. Let me turn to Mr. Pigott. I read your testimony, and one thing I was surprised at was to read on page 6 and to find that in the final decision there was a moratorium recommendation of 5 years, for you not to pursue further permit applications in the area. Help me understand the strange genius, if there is anything like that, behind that recommendation. What is the moratorium purpose?

Mr. PIGOTT. It is a good question, and I suspect that the purpose was to develop these two projects and let them run for 5 years and let all of the people in the community up there see that they were not intrusive.

Mr. GIBBONS. But isn't that the purpose of the EIS or the EA assessments, to show that these are not going to be environmentally disturbing?

Mr. PIGOTT. Of course. And our EIS up there was very substantial. It really was an extreme case of overkill. One of the things we had to do was a $180,000 ethnographic study of cultural uses and historic uses by various tribes up there.

And considering the size of the project and really the small footprint, you know, I thought that it was a high degree of overkill. But a lot of times, an EIS and NEPA review is fairly subjective, and it depends on the people who are directing it as to just how far they want to go with it. In this case, they took it to great extremes; and probably because of the fact that it was the Forest Service and the BLM together.

Mr. GIBBONS. In your experience in the permitting process with this whole thing, the purposes many times of these delays and lawsuits that are filed, are they filed for meritorious reasons, or are they simply filed to delay, perhaps hoping that you will abandon the project, or hoping that you will change the project? Which is your gut feeling on those?

Mr. PIGOTT. In this case, the intent was to delay the project long enough until we got fed up and just left. And I think that that was the interest; certainly the interest of the project opponents. And I suspect it was the interest of some people in the agencies.

Mr. GIBBONS. How much do you think that process cost you?

Mr. PIGOTT. The entire process has cost us over $3 million in actual out-of-pocket costs for doing the EIS.

Mr. GIBBONS. And has the result changed anything, from your EIS?

Mr. PIGOTT. No. No, it has not.

Mr. GIBBONS. Mr. Ain, very quickly, in the few minutes I have remaining or the little time I have remaining, you talk about the differences and the uncertainty on military reservations with regard to leasing, and the cost of royalties and all of that. Would you then recommend—and I think that was part of your testimony, as I understand it—to remove that leasing capability or royalty decision from the military, and put it in, for example, with the Department of Interior?

Mr. AIN. That would be our recommendation, consistent, of course, with the Department of Interior making judgments that respect the military mission. However, once the military determines that there is a portion of their reservation that is appropriate for geothermal development, and consistent with that recommendation, we think it should be with the Department of the Interior, yes.

Mr. GIBBONS. Let me ask a real brief question. Is the amount of electrical charge that they are paying, or costs they are paying for your development, is it commensurate with utility rates on the market out there that are in the local area?

Mr. AIN. Well, let me say, a percentage of gross to the Navy at Coso. Whereas, under the BLM formula, we pay a percentage of net. And as I say, it is about two and a half times less than our current arrangements at Coso. This is a royalty structure that otherwise would apply. And that is after negotiations. So you have the transactional cost, plus the uncertainty, plus the ongoing administrative cost of dealing in that environment. So it is a disincentive

to working on what could be very good prospects within military reservations.

Mr. GIBBONS. Are the time frames in the lease similar?

Mr. AIN. No. They are shorter.

Mr. GIBBONS. Shorter?

Mr. AIN. Yes.

Mr. GIBBONS. So there is more uncertainty?

Mr. AIN. There is more uncertainty there. And the renewals are at their discretion.

So we have a unique circumstance at Coso. We are very happy with that circumstance. It has been a good project for us. But it has taught us a lot. We are trying to give you the benefit of that lesson.

Mr. GIBBONS. Finally, let me just say that if you would be so kind as to submit to this committee a summary of your recommendations for all of our panelists on what you think are the most critical issues, and how we in Congress can address those issues with regard to improving the system for permitting and processing and developing geothermal, we would appreciate that.

Mr. AIN. Thank you very much.

Mr. GIBBONS. Thank you. Thank you, Madam Chairman.

[The information referred to follows:]

HOUSE RESOURCES TESTIMONY RECOMMENDATIONS

In response to the questions of Representative Gibbons, the Geothermal Energy Association offers the following recommendations for the hearing record. They examine both administrative and legislative actions that could be taken to encourage greater use of geothermal resources on the public lands.

Permitting, Leasing, Public Lands Access, And Other Regulatory Delays/Impediments

There are serious problems facing geothermal energy development on public lands. In many ways, the problems facing geothermal development mirror those of natural gas development, and are often exacerbated by geothermal energy's higher risk and much higher capital costs. To mitigate these extraordinary delays and costs, we encourage the federal land management and regulatory agencies to achieve the following goals, and suggest some of the actions they should consider in each case.

1) Establish as a national priority, consistent with other laws, developing and expanding the use of geothermal energy resources on federal lands.

- Federal agencies, including but not limited to the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS), involved in geothermal leasing, permitting or other reviews should be directed to give geothermal energy projects expeditious and priority consideration and minimize impediments and unnecessary requirements upon geothermal operations

- Direct BLM to eliminate the backlog of existing lease applications within six months, and to issue leases with stipulations if needed to expedite the process.

2) Ensure that the processing of needed, clean energy projects on public lands is handled with a sense of urgency and priority by reducing bureaucratic delays from years to months, if not weeks.

- Set fixed time periods for major agency actions -- lease issuance, EA or EIS completion, permit review, etc. -- and adhere to these timeframes. The Department of the Interior should review its regulations and existing legal authority to enhance BLM's authority under the Geothermal Steam Act to ensure timely decisions or actions involving geothermal leases and subsequent permitting or review, including actions taken by other agencies, and to establish specific goals and timeframes for completion of leasing, permitting and other actions;

- Expedite the process for granting easements needed for a power project to interconnect with the grid.

- Ensure adequate staff to conduct reviews by retaining the federal share of royalties for BLM use, and/or allow companies to hire independent contractors to assist federal agencies and reimburse them for the costs involved through a reduction in future royalties.

- Eliminate the backlog of appeals at the Interior Board of Land Appeals, and adopt new procedures to ensure prompt decisions on future appeals.

- Review the current system of defining KGRAs to determine whether it should be modified or eliminated.

- Give priority to updating planning and environmental documents in areas with significant geothermal potential

3) Eliminate repetition and duplication in the process. The Calpine proposal was held up repeatedly while the same issues were examined over and over again by different federal and state agencies.

- Direct BLM to take the lead in establishing agreements between federal and state agencies about their respective roles in project evaluation and review. This might be handled informally, or through development of an MOU, depending upon the circumstances.

- Direct federal agencies to respond to issues raised by appeals before local or state agencies that are matters upon which they have reached a factual conclusion.

- Encourage Federal and State agencies to work cooperatively with industry on areas of mutual concern through a national geothermal coordinating committee.

4) Strike a more responsible balance between our need for new, clean energy supplies, and other uses and values for the public lands.

- Establish clear procedures and timeframes for reaching decisions when there are conflicts between energy development and other uses or values of the public lands.

- Establish guidelines for agencies to use in adopting mitigation measures to ensure that mitigation is necessary and the measures proposed are justified.

- The U.S. Geologic Survey should conduct a new assessment of the geothermal potential on public lands. The U.S. Geologic Survey should develop their approach in cooperation with industry, DOE and the research community to bring state-of-the-art knowledge to bear on this new assessment.

5) Ensure reasonable access to public lands, including military lands, and lease terms that reflect the public interest in developing geothermal energy resources.

- Amend federal law to place geothermal leasing on military lands under the Geothermal Steam Act, subject to consultation with the Department of Defense.

- As part of the Record of Decision on geothermal projects assess the total impact of the various mitigation measures proposed to ensure that they do not make the project uneconomic or otherwise undevelopable.

- Where lands are not formally withdrawn from mineral leasing, direct the BLM to issue leases within specified time frames unless the surface management agency provides specific reasons to prolong decision making.

- Review the current system of defining KGRA's to determine whether it should be modified or eliminated.

Further, we would encourage the Department to consider addressing equity issues raised by Native Americans regarding geothermal lease royalties. It does appear unfair when local communities share in the royalties from geothermal projects but a local Native American Tribes does not. Nearby Native American communities may be just as affected by development and may operate schools, clinics and other facilities similar to local governments. Perhaps part of the federal royalty share should be deposited into a fund administered by the Secretary of the Interior to benefit such Tribes.

Government Procurement And Energy Purchasing

The potential for the U.S. government to play a role in encouraging the development of renewable resources through procurement and energy purchasing is also an area of interest to the geothermal energy industry. Obviously, these are efforts that could benefit the expansion of geothermal energy in the West by encouraging one of the largest consumers, the federal government, to purchase "green" power.

However, efforts to date along these lines have shown little promise to provide any real results. The limited goals for renewable energy purchasing set by the last Administration appear unlikely to be met. Moreover, there is a tendency to achieve these goals through mechanisms that may, in fact, contribute to reduced reliability. This is particularly problematic if green tag programs, or similar efforts, value only energy and do not recognize the reliability or capacity value of base load or load-following resources like geothermal energy.

In its testimony before the Senate Energy Committee, Cambridge Energy Research Associates made the following point: "Long ago, economists recognized that setting up a power market with the right price signals requires payments for two electric commodities--energy and capacity."

Given the substantial purchasing power of the federal government, its efforts to promote renewables through green purchasing programs should be designed to encourage a full portfolio of technologies. By providing incentives for both intermittent and baseload power, the federal government will be sending the right signal to the market and ensuring that renewable energy supplies also contribute to the reliability of the electric power system.

Financial Incentives for Expanded Geothermal Production

One of the most significant actions that Congress could take to encourage greater geothermal energy production would be to make geothermal facilities eligible for the existing Section 45 tax credit known as the "production tax credit" or "PTC." Presently, the PTC provides a 1.5 cent/kilowatt hour tax credit for the energy produced by new wind energy facilities for each of the first ten years of operation. This credit has unquestionably fueled the dramatic expansion of the wind industry in the US, but unfortunately this has at times occurred at the expense of the geothermal industry. This tax credit is much more effective than the tax treatment given new geothermal facilities, and the difference the PTC makes in lowering wind industry bid prices has often been the difference in competitive situations. As a result, the present federal tax code is effectively picking winners and losers between renewable technologies.

Expanding the PTC to geothermal energy and other renewables would be more equitable and encourage development of all renewable energy resources. Federal tax incentives would no longer favor wind energy over other renewable technologies, allowing the market to choose which renewable technologies to pursue resulting in a healthier mix of energy options. In addition, we would recommend that the existing, smaller investment tax credit be made available to all renewables as well, with an explicit requirement that companies choose one or the other at the outset of the project to avoid double-dipping. Extending these credits for five or more years would also improve business certainty, amplifying their impact on investors and benefits to the Nation.

Changes in the royalty provisions could be of significant benefit to expanded geothermal production. Changes could provide both a financial incentive, and reduce the administrative burden of the current system. Some examples of actions that should be considered are:

- For direct use applications, a simplified approach that replaces royalties with a rental fee would reduce the significant disincentive of the existing netback royalty system. For public authorities or small non-consumptive users, eliminating royalties and adopting a simpler fee system would be an significant incentive for the expanded use of these publicly beneficial direct use applications.

- For geothermal electric projects, in addition to the incentives above the MMS should consider either reducing royalties, or reforming the netback methodology to have well field costs fully included. They should also look at a simpler formula that either uses gross proceeds or a gross percentage or mills/kWhr basis. The Congress might also consider whether legislation of a simpler formula wouldn't provide more certainty for all involved.

Thank you for your consideration of these ideas. We look forward to working with the Committee and Congress towards achieving the goal of expanded geothermal energy use in the US.

Mrs. CUBIN. One question before I move to Mr. Flake.

Mr. Ain, how do you make that royalty check out that you pay to the Navy?

Mr. AIN. To the Navy.

Mrs. CUBIN. To the United States Navy?

Mr. AIN. Yes.

Mr. HOFFMAN. Yes.

Mrs. CUBIN. So it goes in their Treasury. We need to look into that.

[Laughter.]

Mrs. CUBIN. The Chair now recognizes Mr. Flake.

Mr. FLAKE. Thank you, Madam Chair. Thank you, panelists. This has broadened my understanding, certainly. And it seems consistent with a lot of the hearings we hold, the complaints about Federal agencies.

And if I get it right, I would like to have a follow-up on this, but your complaints are not so much with the excessive royalties, or whatever; it is just the uncertainty of the process, the cumbersome regulations moving forward, the 5-year period you talked about, Mr. Pigott. Just I cannot imagine going through that on a continual basis.

Along those lines, if you want to address that, Mr. Pigott, the royalty structure, you are lobbying for a uniform royalty structure. Do you think that we need to jump-start, particularly now that we need more energy and the Energy Policy Group is working forward? Do we need to look at the royalty structure in terms of lessening the payment? Or would you just settle to make it uniform across the board, and not have to deal with the uncertainty moving forward?

Mr. PIGOTT. I think that Mr. Ain is the one to answer.

Mr. FLAKE. Yes. Okay. Go ahead.

Mr. AIN. Yes. Our recommendation would be, number one, the Congress has made a judgment about what is an appropriate level of royalties in the past. And I think it is, frankly, an anomaly that it did not apply to development on military reservations. And I think the Congress should certainly consider correcting that anomaly and making it consistent. Because you do not want developers to have one set of financial calculations when they are off the military reservation, and one when they are on, because they may be passing up better resources that could be developed on a military reservation with minimal environmental intrusiveness. So that is why we have made the recommendation, from our experience that we are—

Mr. FLAKE. But their argument in not having a uniform policy is that you have to have different protections within military areas, or they want to negotiate a different cost.

Mr. AIN. We already pay for those protections. We have additional security. We have to have off-site control rooms.

Mr. FLAKE. This is apart from the royalty?

Mr. AIN. Apart from the royalty.

Mr. FLAKE. All right.

Mr. AIN. So that is why I made the comment, maybe we should pay less on military bases.

Mr. FLAKE. Okay.

Mr. AIN. Because it is more expensive to develop there, because at times they impose reasonable conditions to respect their military mission.

Mr. FLAKE. Instead of local interest, whoever can answer this one—Arizona, where some people think you do not have to stick anything in the ground there to get geothermal energy, what resources are being tapped there, and what potential is there for the future?

Mr. GAWELL. As far as I know, there are no geothermal electric plants. In Arizona there is a resource area, I believe—and DOE may be able to address this better—in the southern part of the state.

But again, I will go back to my earlier comments. I am not sure any of the resource estimates are terribly accurate. We have learned a lot in 20 years. The resource estimates do not reflect that. In many cases, I think that if they redid the estimates more carefully, it would not only give us different numbers, but it would give us a lot more certainty for development along those lines.

Mr. FLAKE. Right.

Mr. GAWELL. Almost everything west of the Mississippi has geothermal resources.

Mr. AIN. I think that a lot of it also is a product of economics. And that is, in an environment where you have relatively low, stable energy prices, electric prices, geothermal tends to be more expensive, and you pick off only the best geothermal resource first.

Mr. FLAKE. Right.

Mr. AIN. As energy prices rise, as they certainly have in the West, people will be looking at more marginal resources, and looking to develop them in different places. And issues like land cost, ease of development, environmental permitting, and access to the transmission grid, become a lot more important than before. So perhaps that will encourage some geothermal development in Arizona.

Mr. FLAKE. Are any of the panelists being tapped for expertise or experience with the Vice President's energy panel now? Is he looking to geothermal at all, to your knowledge?

Mr. AIN. Yes. Yes.

Mr. GAWELL. Yes. We have talked to him. And in fact, we have worked with his staff on a couple of things, presented various materials to them. So I cannot say where they are going with it. I have not seen any drafts or internal documents. But we have addressed a lot of the issues we have discussed here with them, as well.

Mr. FLAKE. Okay. That was what I was wondering, if these same recommendations are being made there, as well. Thank you.

Mrs. CUBIN. I think the committee will—I know the committee will—find out what the Navy does with the royalty that it receives. If it pays it to the Treasury, then that is one thing. But if it does not, I just wonder if they might be liable to have to pay the Government back. Because the laws about royalty payments are pretty clear, where the payments should go.

And Mr. Gawell, in response to you about a new inventory of possible geothermal resources, I just wonder, is that the law with the Government to do that, or is that what industry should be doing?

It seems like in the other energy sources, that industry goes out and pokes a hole and comes up with those sorts of things.

I am not asking for an answer, but I just think it is something that we need to think about. If you would like to comment, you are welcome to.

Mr. GAWELL. No, I think that the Government has played a role over many years, in understanding the basic geology of the United States. And it has helped the oil and gas industry. I know they spent a substantial amount of money helping them understand the basic structures they are dealing with, understanding the geology, the science of the geology itself, doing various baseline geologic surveys.

Once you get past that, once you get into areas where now we are looking for a specific site to develop, in which, "We think this is interesting, we want to go over there and drill some early test wells," then I think you get to the point where we do not want the Government involved.

But they are sort of a baseline of information which has underlined everything we have done in this country on public land minerals. It has underlined most of the work that the oil and gas industry has done and the geothermal industry has done, as well.

And there is an ongoing effort, I believe, in most of the other areas; but I think the geothermal work has pretty much been set aside.

Mrs. CUBIN. And I think it could be brought to the forefront.

Do you have anything further, Mr. Gibbons?

Mr. GIBBONS. No.

Mrs. CUBIN. Another thing I would like to say for the record, before we close the hearing, is that Mr. Kind, the Ranking Member, is in the Education Committee doing a markup of the President's education bill. And he is always here for the hearings, and he is usually here from gavel to gavel. And so I really was not referring to the Ranking Member with my remarks. But I remain frustrated with the lack of participation and working together to try to get a solution to this energy crisis that we are in.

So with that, I would like to thank this panel very much, and also mention to you that the members may have questions that they would like to submit to you in writing. And we would appreciate your answering that.

So with that, the committee is adjourned.

[Whereupon, at 12:09 p.m., the subcommittee was adjourned.]

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