POTENTIAL ALTERNATIVE ENERGY SOURCES AVAILABLE ON NATIONAL PUBLIC LANDS

OVERSIGHT HEARING

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OVERSIGHT HEARING ON POTENTIAL ALTERNATIVE ENERGY SOURCES AVAILABLE ON NATIONAL PUBLIC LANDS

Wednesday, October 3, 2001
U.S. House of Representatives
Committee on Resources
Washington, DC

The Committee met, pursuant to other business, at 11:23 a.m., in Room 1324, Longworth House Office Building, Hon. Barbara Cubin presiding.

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

Mrs. CUBIN. [Presiding.] The full Committee will now come to order for the purposes of this hearing. I would like to begin by thanking Chairman Hansen for scheduling today's full Committee hearing on the potential for alternative energy sources for the Nation's producible minerals from our public lands. Chairman Hansen has been called away for an important meeting on security issues surrounding the Winter Olympic Games to be held in his State and district just a few months from now. Given my Chairmanship of the Energy and Minerals Subcommittee, he has asked me to chair this hearing until his return.

Today we shall hear from the Department of the Interior, the keeper of our public lands, and the Department of Energy, the agency which focuses upon energy technology, research and development, as well as being the chief forecaster of our natural energy demand. Our second panel has witnesses from the geothermal, solar and wind energy communities. Chairman Hansen chose to focus the scope of this hearing to these alternative energy sources, which by many accounts we have in abundance beneath or over our public lands.

President Bush's national energy policy acknowledges the need to further the role of alternative energies in order to achieve more self-sufficiency in meeting our energy needs. The events of September 11th and the aftermath of those attacks upon our Nation, in my mind, underscore the call for more domestic energy sources and less reliance upon crude oil imported from countries which may or may not turn off the spigot as a means to conduct foreign policy. My Subcommittee has explored the issue of public lands'

availability for natural gas, oil, coal-bed methane, coal and geothermal resources.

H.R. 4, the Securing America's Future Energy Act of 2001, included provisions for the assessment of alternative energy potential from the public lands together with an analysis of impediments to the timely development of such resources. The other body has yet to bring forth an energy package, but I trust that when they do, it, likewise, will contain provisions to advance the alternative energy sources.

But now, how much geothermal, solar and wind can they realistically contribute? Where is it concentrated on our public lands? How do we get the energy across public lands to demand centers? Will the siting concerns of environmental groups, which look at every turn when conventional energy sources are proposed for development, thwart otherwise viable wind farms, large solar arrays or geothermal power plants? These are issues which must be tackled in developing a rational energy policy, which is a necessary component of a realistic national security policy, as well.

I would like to now recognize Mr. Rahall for an opening statement.

STATEMENT OF THE HON. NICK J. RAHALL II, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WEST VIRGINIA

Mr. RAHALL. Thank you, Madam Chair. I welcome all the panel this morning, particularly my friend of old days, Steve Griles. I understand he is the new and improved Steve Griles, at least I hope that is the case. As we all know, this is not Steve's first appearance before this Committee or his first tour of duty at the Interior Department. During his last stand at the department, Steve served as Assistant Secretary for Energy and Minerals. At the time, we were often at odds on some very controversial matters. So, today, I am pleased to report that I was right and Steve was wrong.

Steve resisted my ultimately successful efforts to reform the onshore oil and gas program, as well as to halt oil shale mining claim giveaways. History now shows that my reform legislation, particularly on oil and gas, has served the public well. All leases are initially offered competitively. We are receiving more bid dollars and the red count is very healthy. I stated that new and improved Steve Griles is now with us because I am advised by staff that he has mellowed out somewhat over the years. Certainly, when he worked as a lobbyist, we found that to be the case. So again, I welcome you to the Committee, Steve. I look forward to working with you and there are some very important issues that face us together at this time. For instance, I look forward to you being a strong voice in support of retaining the new 3809 regulations on hard rock mining. That would be a nice start to prove the new and improved Steve Griles is really before us.

Thank you, Madam Chairman.

Mrs. CUBIN. I now recognize the first panel: Mary J. Hutzler, Acting Administrator, Energy Information Agency, Department of Energy; the Hon. David Garman, Assistant Secretary, Energy Efficiency and Renewable Energy, Department of Energy; and the new and improved Hon. J. Steven Griles, Deputy Secretary of Interior, U.S. Department of Interior. I would now recognize Mrs. Hutzler.

STATEMENT OF MARY J. HUTZLER, ACTING ADMINISTRATOR, ENERGY INFORMATION ADMINISTRATION, DEPARTMENT OF ENERGY, WASHINGTON, D.C.

Ms. HUTZLER. Madam Chair and members of the Committee, I appreciate the opportunity to appear before you today to discuss renewable energy markets in the United States. The Energy Information Administration is an autonomous statistical and analytical agency within the Department of Energy. We are charged with providing objective, timely and relevant data, analysis and projections for the use of Department of Energy, other government agencies, the U.S. Congress and the public. Our baseline projections in energy trends are widely used by government agencies, the private sector and academia.

The projections that I will be discussing today are from our annual energy outlook and from the service report that we published this July. We expect total energy consumption to increase in the United States from 99 quadrillion British Thermal Units in 2000, to 128 quadrillion BTUs in 2020, an average annual increase of 1.3 percent. Of this amount, renewable energy consumption represents a 7-percent share. In 2020, about 54 percent of renewables is expected to be used for electric generation and the rest for dispersed heating and cooling, industrial uses and fuel blending.

Total grid-connected electricity generation from renewable sources is projected to increase by 85 billion kilowatt-hours between 2000 and 2020, representing between 9 and 10 percent of total electricity generation, as depicted in this chart. Generation from renewables other than hydroelectricity is projected to increase 64 billion kilowatt-hours, between 2000 and 2020, increasing its share of total generation from 2.2 percent in 2000 to 2.8 percent in 2020. Most of the projected increase in non-hydro renewables is expected from biomass, landfill gas, geothermal energy and wind power.

State mandates and other incentives, including the Federal protection tax credit for generation from new wind facilities, encourage much of the growth in renewables, particularly in the earlier part of the forecast. Further penetration of renewables is slowed by the total cost of renewable generation, relative to fossil-fuel technology. While cost reductions are projected over time for renewable technologies, the cost of coal- and gas-fired generation are also expected to decline, resulting in higher costs per kilowatt-hour for new wind, biomass or geothermal generation than for other new coal- or natural gas-fired combined-cycle generation through 2020.

Nevertheless, total non-hydroelectric renewable electricity generation is projected to grow at a faster rate than each of the conventional energy sources of generation, with the exception of natural gas, renewable resources plentiful. For example, total resources for the three best of the six classifications of available wind in the United States are enough to power approximately 2,500 gigawatts of generating capacity, or about three times the current installed capacity base.

However, the cost of utilizing renewable resources can be considerably higher than those of the fossil fuels, making them less likely to be exploited. Barriers to the adoption of production of renewable resources include their higher capital cost, the intermittent nature

of wind and solar technologies, the difficulty of accessing resources in mountainous or other difficult-to-reach terrain, the cost of connecting to and upgrading to the transmission grid, and environmental issues including disruption of fish and animal habitats, cultural or aesthetic objections and the use of parkland.

Demand for renewable energy is relatively small under our reference case conditions. In order to show the impact of alternative assumptions concerning the key factors driving renewable energy markets, we examined alternative cases. In our high renewables case, we assumed more favorable characteristics for non-hydroelectric renewable generating technologies than in the reference case, including lower capital costs and operations and maintenance costs, increased biomass fuel supplies and higher capacity factors for solar and wind generation. This case is depicted by the right-hand bar in this chart. In this case, generation from non-hydro renewables increases by 94 billion kilowatt-hours, representing 4.6 percent of total generation, compared to the 2.8 percent in the reference case.

We also analyzed two renewable portfolio standards, one in which 10 percent of electricity sales were required to be reduced from renewable resources by 2020, and the other requiring 20 percent renewable production. When a 20 percent renewable portfolio standard is required, total non-hydroelectric renewable generation is more than six times the level in the reference case by 2020. This requires 176 gigawatts of non-hydroelectric renewable capacity, which is depicted regionally in this chart and compared against the reference case. Reaching this target is expected to require increasing use of more expensive renewable options, resulting in electricity prices over 4 percent higher than the reference case of 2020.

In conclusion, over the forecast period, we expect the use of renewable resources of energy to increase. However, this increase is expected to proceed at a relatively slow pace, due mainly to the relative cost of these technologies compared with fossil-fuel technologies. While renewable technology costs have declined, so have those of coal and natural gas. However, lower technology costs, higher fossil fuel prices, increased research and development or more favorable renewable policies could alter the outlook for renewables.

Thank you and I will be happy to answer any questions you may have.

[The prepared statement of Ms. Hutzler follows:]

Statement of Mary J. Hutzler, Acting Administrator, Energy Information Administrtion, Department of Energy

Mr. Chairman and Members of the Committee:

I appreciate the opportunity to appear before you today to discuss renewable energy markets in the United States.

The Energy Information Administration (EIA) is an autonomous statistical and analytical agency within the Department of Energy. We are charged with providing objective, timely, and relevant data, analysis, and projections for the use of the Department of Energy, other government agencies, the U.S. Congress and the public. We do not take positions on policy issues, but we do produce data and analysis reports that are meant to help policy makers determine energy policy. Because we have an element of statutory independence with respect to the analyses that we publish, our views are strictly those of EIA. We do not speak for the Department, nor for any particular point of view with respect to energy policy, and our views should not be construed as representing those of the Department or the Administra-

tion. However, EIA's baseline projections on energy trends are widely used by government agencies, the private sector, and academia for their own energy analyses.

The projections in this testimony are from the Annual Energy Outlook 2001 (AEO2001) published by EIA in December 2000, which provides projections and analysis of domestic energy consumption, supply, prices, and energy-related carbon dioxide emissions through 2020; and from the report Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plants: Sulfur Dioxide, Nitrogen Oxides, Carbon Dioxide, and Mercury and a Renewable Portfolio Standard (Strategies), released by EIA in July 2001. The projections in these reports are not meant to be exact predictions of the future, but represent possible alternative energy futures, given technological and demographic trends, current laws and regulations, and consumer behavior as derived from known data. EIA recognizes that projections of energy markets are highly uncertain, subject to many random events that cannot be foreseen, such as weather, political disruptions, strikes, and technological breakthroughs. In addition to these short-term phenomena, long-term trends in technology development, demographics, economic growth, and energy resources may evolve along a different path than projected in the reference case, many of which are explored through alternative cases such as the High Renewables case presented in this testimony.

ENERGY CONSUMPTION TO 2020

Total energy consumption is projected to increase from an estimated 99.1 quadrillion British thermal units (Btu) in 2000 to 128.2 quadrillion Btu in 2020, an average annual increase of 1.3 percent. Energy consumption in the United States increased from 67.9 quadrillion Btu in 1970 to 81.0 quadrillion Btu in 1979, with a downturn in 1974 and 1975 following the 1973–74 oil price increases associated with the first oil embargo. During the early 1980s, energy consumption again declined to 73.3 quadrillion Btu in 1983, due in part to the second oil price increase. Since 1983, energy consumption has been generally increasing, with an average annual increase of 1.8 percent through 2000.

Total renewable energy consumption, including ethanol used in gasoline, is projected to increase from 6.9 quadrillion Btu in 2000 to 8.6 quadrillion Btu in 2020, an average annual growth of 1.1 percent (Figure 1). In 1970, renewable energy consumption in the United States was 4.1 quadrillion Btu. Renewable energy resources include hydroelectric power, wood, and waste, with small amounts of geothermal, wind, and solar resources.[1] The share of total energy consumption that is derived from renewable sources is projected to be 7 percent in 2020, approximately the same share as in 2000. In 2020, about 54 percent of renewables is expected to be used by electricity generators (excluding cogenerators) and the rest for dispersed heating and cooling, industrial uses (primarily cogeneration), and fuel blending (Figure 2).

These projections incorporate the impacts of renewable-related laws and regulations, including the Production Tax Credit (PTC) for new electric generating capacity powered by wind and closed-loop biomass (currently in effect through December 31, 2001) established by the Energy Policy Act of 1992; the Renewable Energy Production Incentive established by the same legislation; and various State initiatives, including the California AB1890 subsidy program for qualifying renewable energy facilities, and State Renewable Portfolio Standards promulgated by Arizona, Iowa, Texas, Massachusetts, Minnesota, New Jersey, and Nevada. In addition, the projections include all capacity currently under construction, for which contractual commitments have been made, or utilities have made public commitments, and are expected to come on line between now and the end of 2002. Finally, these projections assume a continuation of research and development funding by the U.S. Department of Energy at approximately the same levels as recent history through 2020. Since the reference case includes only those laws, regulations, and standards in effect as of July 1, 2000, any further extensions of the PTC, as proposed by the Bush Administration's National Energy Policy, or other proposed laws and regulations relevant to renewable energy are not included.

Transportation.

Transportation energy demand is expected to increase at an average annual rate of 1.8 percent to 38.5 quadrillion Btu in 2020 and is the fastest growing end-use sector. The growth in transportation use is driven by 3.6-percent growth in air travel, the most rapidly increasing transportation mode, and 2.0-percent annual growth

[1] Ocean thermal, tidal, and wave resources are not included in these projections because they are not expected to become economically viable by 2020.

in light-duty vehicle travel, the largest component of transportation energy demand, coupled with slow growth in vehicle efficiency.

Advanced technology vehicles, representing automotive technologies that use alternative fuels or require advanced engine technology, are projected to reach nearly 2.0 million vehicle sales (12.1 percent of total projected light-duty vehicle sales) by 2020. The leading technologies are gasoline hybrid electric vehicles and alcohol flexible-fueled vehicles. The use of renewables in the transportation sector, specifically ethanol, is projected to increase at an average rate of 2.8 percent per year between 2000 and 2020. This represents a near-doubling of the use of ethanol to 0.24 quadrillion Btu by 2020. Ethanol in the form of E85 is consumed primarily by light-duty flexible-fueled vehicles and dedicated E85 vehicles, but the majority of ethanol is used for gasoline blending, about 88 percent in 2020. All alternative fuels consumed by light-duty vehicles are projected to displace about 230,000 barrels of oil equivalent per day by 2020, or 2.1 percent of light-duty vehicle fuel consumption.

Bans on methyl tertiary butyl ether (MTBE) as a motor gasoline oxygenate in a number of States due to groundwater contamination may stimulate additional ethanol consumption as a substitute for MTBE. While the forecast included all eight State bans as of the summer of 2000, five States have instituted bans since that time, meaning that future ethanol consumption could be higher as a result of those and possible additional bans by other States.

Residential and Commercial.

Residential energy consumption is projected to increase at an average annual rate of 1.1 percent, reaching 24.6 quadrillion Btu in 2020. The growth is led by energy demand for a variety of electricity-using equipment and appliances. Residential electricity use is projected to increase at an annual rate of 1.8 percent.

Commercial sector energy consumption is projected to increase at an average rate of 1.3 percent annually, to 21.3 quadrillion Btu in 2020. Similar to the residential sector, electricity consumption for telecommunications, computers, office equipment, and other appliances is the fastest growing area, with total commercial electricity demand increasing at an average annual rate of 1.8 percent.

Currently, the combined residential and commercial buildings sectors use about 0.6 quadrillion Btu of renewable energy, primarily wood consumed for residential space heating and secondary heating. This is expected to decline slightly through 2020. Renewable energy is also used in applications such as ground-source heat pumps that use geothermal energy for heating and cooling and photovoltaic (PV) solar systems that generate electricity. Grid-connected PV solar systems on buildings are projected to comprise over 350 megawatts of distributed generating capacity by 2020, aided in large measure by programs such as Million Solar Roofs that promote growth in the PV market.

Industrial.

Industrial energy demand is projected to increase at an average rate of 1.0 percent per year, reaching 43.7 quadrillion Btu in 2020. Total industrial output is expected to grow at an average rate of 2.9 percent per year; however, the fastest growing industrial sector is non-energy- intensive manufacturing with an average annual growth of 3.4 percent. Energy-intensive manufacturing and nonmanufacturing have growth rates of 1.2 and 1.6 percent, respectively. This structural shift in the industrial sector, combined with ongoing efficiency improvements, helps to moderate the increase in industrial energy demand.

Consumption of biomass byproducts in the pulp and paper, lumber, and food industries accounts for most of the renewable energy consumed in the industrial sector. Biomass consumption is projected to increase from 2.0 quadrillion Btu in 2000 to 2.9 quadrillion Btu in 2020, a 1.9- percent average annual growth rate. Biomass often is used in cogeneration, the simultaneous production of useful thermal energy and electricity. The higher projected availability of biomass leads to additional biomass-based cogeneration capacity, which is projected to increase from an estimated 4.6 gigawatts in 2000 to 7.5 gigawatts in 2020, a 2.5-percent average annual growth rate.

Electricity Generation.

During the 1960s, electricity demand grew by more than 7 percent per year, nearly twice the rate of economic growth (Figure 3). In the 1970s and 1980s, however, the ratio of electricity demand growth to economic growth declined to 1.5 and 1.0, respectively. Several factors have contributed to this trend, including increased market saturation of electric appliances, improvements in equipment efficiency and utility investments in demand-side management programs, and more stringent equipment efficiency standards. Throughout the forecast, growth in demand for office equipment and personal computers, among other equipment, is dampened by slow-

ing growth or reductions in demand for space heating and cooling, refrigeration, water heating, and lighting. The continuing saturation of electricity appliances, the availability and adoption of more efficient equipment, and efficiency standards are expected to hold the growth in electricity sales to an average of 1.7 percent per year between 2000 and 2020. This is lower than the expected 2.9-percent annual growth in gross domestic product, although the projected increases in electricity usage for information technology such as computers, scanners, fax machines, and other equipment will partially offset the efficiency improvements.

Total grid-connected electricity generation from renewable sources is projected to increase from 363 billion kilowatthours in 2000 to 448 billion kilowatthours in 2020 (Figure 4). Renewables decline from a 9.5-percent share of electricity generation in 2000 to 8.5 percent in 2020. Generation from renewables other than hydroelectricity is projected to increase from 84 billion to148 billion kilowatthours between 2000 and 2020, increasing slightly from a 2.2-percent share of total generation in 2000 to a 2.8-percent share in 2020. Other than recovering from an abnormally dry year in 2000, conventional hydroelectricity is expected to remain essentially unchanged through 2020. Most of the projected increase in non-hydro renewables is expected from biomass (2.4 percent annual growth rate), waste (including landfill gas) (1.3 percent annually), geothermal energy (4.0 percent annual growth rate), and wind power (6.9 percent annual growth rate) (Figure 5). State mandates and other incentives, including the Federal production tax credit for generation from wind, encourage much of the growth in renewables, particularly in the earlier part of the forecast period.

Further penetration of renewables is slowed by the total cost of renewable generation relative to fossil-fired technology. Despite cost reductions that are projected over time, the cost per kilowatthour of building new wind, biomass, or geothermal generation is expected to remain higher than that of either coal or natural gas-fired combined cycle generation through 2020 (Figure 6). Most of the new wind capacity is projected to occur as a result of state mandates and subsidies as opposed to cost-based competition. Geothermal resources are found at some 50 specific sites in the West, with production costs varying significantly from the lowest-cost sites to the highest. Nevertheless, total nonhydroelectric renewable electricity generation is projected to grow at a faster rate than each of the conventional energy sources of generation, with the exception of natural gas. If, in reality, future natural gas supplies and prices are different than projected in the reference case, the expected outlook for renewable sources of energy could be different.

Table 1 shows the overnight capital costs and performance characteristics of new renewable and fossil fuel-based generating technologies. Of the available technologies, those that are fueled by natural gas generally have the lowest overnight construction costs, as well as low fixed operating and maintenance costs. While their fuel costs tend to be high, they are more than offset by the other cost components. Except for wind, renewable technologies are relatively more expensive than their fossil-fueled counterparts, ranging from about $1300 to nearly $3700 per kilowatt. In addition, capacity factors for the intermittent technologies, wind and solar, are about a third to half of the factors for the fossil-fueled technologies, making the renewable technologies less suitable for baseload electricity demand compared to the fossil technologies.

There are other barriers to the adoption and production of renewable resources. As intermittent resources, wind and solar are not always available to meet the demand for electricity, limiting their value as a generation source. In order to maintain system reliability and stability, the general rule is that intermittents should comprise no more than about 10–15 percent of a system's total generation. Also, while there are large wind resources in the United States, they become progressively more expensive and difficult to exploit as the more easily developed resources are used. For example, many wind resources are available in mountainous terrain not suitable for construction of turbines, there may be objections to the siting of turbines in some areas due to environmental reasons, and transmission facilities may not be available. Some renewable resources, such as some geothermal sites, are found on or near parkland, inhibiting their potential for development. Dams required for the production of hydroelectricity, the largest of the renewable resources, have recently come under question from environmentalists due to their disruption of fish habitats and migration. Such issues may arise during the relicensing process for existing dams, and are an important factor, along with cost, in inhibiting construction of new dams altogether.

Renewable Resources Estimates.

Renewable resources are plentiful. Total resources for the three "best" of the six classifications of available wind in the U.S. are enough to power approximately 2500

gigawatts of generating capacity, or about three times the current installed capacity base. Biomass resources are sufficient to support between 5.6 and 7.1 quadrillion Btu of consumption per year over the next 20 years, more than double the current rate of biomass consumption. Estimates of total geothermal resources, including both identified and undiscovered categories, range as high as 280 gigawatts, far above current installed geothermal capacity. However, the costs of utilizing renewable resources are considerably higher than those of coal, natural gas, and petroleum, making them less likely to be exploited than those of the fossil fuels. Factors that tend to drive up the costs vary across resource type, but include such barriers as mountainous terrain (in the case of wind), costs of exploration and proximity to parkland (geothermal), and costs of gathering plus alternative uses of the available land (biomass). In addition, because renewable resources are generally not transportable, they must be utilized near existing transmission lines, or new lines must be built to serve them. This tends to further limit their competitive position compared to the fossil fuels. Finally, as discussed earlier, a number of environmental issues, such as questions of noise and visual pollution related to wind turbines, must be addressed in order to fully utilize the available resources.

ALTERNATIVE CASES

In order to show the impact of alternative assumptions concerning the key factors driving renewable energy markets, the following are summaries of alternative cases examining more optimistic cost and performance assumptions for renewable generating technologies and assuming a renewable portfolio standard (RPS), which requires a fixed percentage of electricity sales to be produced from renewable sources of generation.

High Renewables.

A high renewables case assumes more favorable characteristics for nonhydroelectric renewable generating technologies than in the reference case, including lower capital cost, operations and maintenance costs, increased biomass fuel supplies, and higher capacity factors for solar and wind generation. The assumptions in this case approximate the renewable energy technology goals of the U.S. Department of Energy. Under these assumptions, total generation from nonhydroelectric renewables is projected to reach 242 billion kilowatthours in 2020, compared with 148 billion kilowatthours in the reference case, increasing from 2.8 percent of total generation to 4.6 percent (Figure 7). Most of the higher renewable generation in this case is from geothermal (40 billion kilowatthours above the reference case) and wind (51 billion kilowatthours higher than the reference case).

Renewable Portfolio Standard Cases.

Under a Renewable Portfolio Standard (RPS), a fixed percentage of electricity sales are required to be produced from renewable sources of generation. Some RPS proposals have included hydroelectricity as a qualifying source, but most havem considered non-hydroelectric technologies only. In the Strategies report, EIA analyzed the impacts of both a 10 percent and a 20 percent RPS, as one potential component of an emissions- reduction strategy.

In the RPS 20% case, it was assumed that the RPS requirement would be phased in over a 20- year period, with 10 percent of electricity sales met by renewable generation by 2010, and 20 percent of electricity sales by 2020. In this case, the RPS is projected to lead to rapid development of new renewable technologies as it is phased in. By 2020, total non-hydroelectric renewable generation would be 947 billion kilowatthours, more than six times the level in the reference case. The primary renewables expected to be developed would be biomass, wind, and geothermal, with some contribution from landfill gas (Figures 8 and 9). With increased generation from nonhydroelectric renewables, generation from natural gas is projected to be lower than in the reference case (Figure 10).

The development of the large amount of renewables that would be needed to satisfy the 20- percent RPS requirement has cost and price implications. Reaching the 20-percent target is expected to require increasing use of more expensive renewable options, and the renewable credit price (effectively, the subsidy paid to owners of nonhydroelectric renewable generating capacity to induce the required level of generation) is expected to become quite high. By 2010, the renewable credit price is expected to be about 4.5 cents per kilowatthour, rising to 5 cents by 2020 (Figure 11). Because electricity producers must hold allowances representing the RPS percentage of their total generation, the impact on prices would be approximately that percentage of the cost of an allowance, e.g., in the RPS 20% case about 1 cent per kilowatthour in 2020. Lower natural gas prices due to reduced use by electricity generators, however, dampen the impact on electricity prices somewhat. As a result,

the price of electricity in the RPS case is expected to average about 3 percent (about 0.2 cents) higher than in the reference case in 2010 and 4 percent higher in 2020.

In the RPS 10% case, in which 10 percent of electricity sales in 2020 must be produced by renewable-based generation, the lower target for nonhydoelectric renewable generation reduces the need for power plant builders to develop renewable projects that are as expensive as those required in the RPS 20% case. As a result, electricity prices in the RPS 10% case are projected to be less than 1 percent higher than in the reference case. Each of the renewable technologies is projected to increase its generation compared to the reference case (except the solar technologies), but with a smaller response than in the RPS 20% case. Geothermal, biomass, and wind-based generation show the largest increases over the reference case.

Energy Policies and Programs.

Due to the policy neutrality of EIA, we do not propose or advocate any particular policies and programs. We do note that, in general, there are a wide range of policies that could alter the energy future described in this testimony by encouraging the development and adoption of additional renewable technologies. Such policies include, but are not limited to, programs to foster research, development, and deployment of renewable technologies, government-industry partnerships, voluntary programs, tax credits and other financial incentives, and renewable portfolio standards. The Administration's National Energy Plan proposes an extension of the Production Tax Credit for wind and closed-loop biomass, and extends it to all new biomass capacity. Such an extension could be expected to increase the penetration of wind-based generating capacity, based on the industry's response to the existing PTC, scheduled to expire at the end of this year. In 2001, nearly 2 gigawatts of new wind-based capacity are expected to be completed, most of which would not have been built in the absence of a PTC. Even though additional subsidies are generally required in concert with the PTC to make such capacity commercially viable, the combination of State programs and a PTC extension could be expected to create additional opportunities for wind-based generation through 2006. For biomass, the PTC is less likely to have a major impact, mainly due to the higher capital costs for constructing biomass capacity, and the relatively high fuel costs compared to other generating technologies such as coal- or natural gas-fired capacity.

Conclusion.

Over the forecast period, we expect the use of renewable sources of energy to increase; however, this increase is expected to proceed at a relatively slow pace, due in part to the relative costs of these technologies compared with fossil-fueled technologies. Technology costs or fossil fuel prices that differ from those in the projections could alter the outlook for renewables. In addition, increased research and development funding or a renewable portfolio standard, stemming, for example, from heightened environmental concerns, could also provide a more favorable economic climate for the penetration of renewable generating capacity, although at a higher cost to the taxpayer or the consumer.

Thank you, Mr. Chairman and members of the Subcommittee. I will be happy to answer any questions you may have.

Table 1. Cost and Performance Characteristics of Electric Generating Technologies

Technology	Overnight Construction Cost, (1999$/kilowatt)	Variable Operating and Maintenance Costs (1999 cents/kilowatt-hour)	Fixed Operating and Maintenance Costs (1999$/kilowatt)	2000 Fuel Costs (1999$/ million Btu)	Maximum Capacity Factor (percent)
Biomass	1464	.283	43.88	2.39	80
Wind	919	.000	26.00	0.00	32
Geothermal	1626	.000	70.69	0.00	87
Solar Thermal	2394	.000	46.72	0.00	42
Solar Photovoltaic	3681	.000	9.85	0.00	28
Landfill Gas	1304	.001	94.01	0.00	90
Pulverized Coal	1021	.330	22.85	1.17	85
Integrated Coal Gasification	1220	.078	31.89	1.17	85
Conventional Natural Gas Combined Cycle	424	.051	15.24	4.45	87
Advanced Natural Gas Combined Cycle	533	.051	14.12	4.45	87
Conventional Natural Gas Combustion Turbine	315	.010	6.30	4.45	92
Advanced Natural Gas Combustion Turbine	440	.010	8.94	4.45	92

Source: Energy Information Administration

Figure 1. Energy Consumption by Fuel, 1970-2020 (quadrillion Btu)

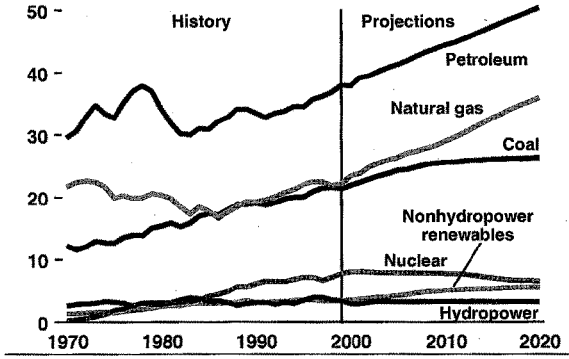


Figure 2. Renewable Energy Consumption by Sector, 1999-2020 (quadrillion Btu)

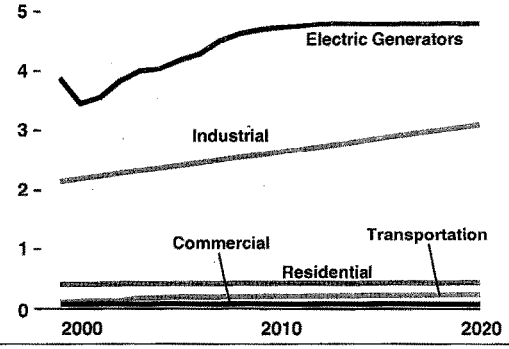


Figure 3. Population, Gross Domestic Product, and Electricity Sales, 1965-2020 (5-year moving average annual percent growth)

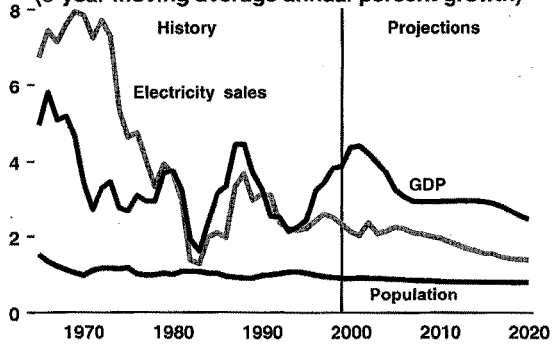


Figure 4. Electricity Generation by Fuel, 1970-2020 (billion kilowatthours)

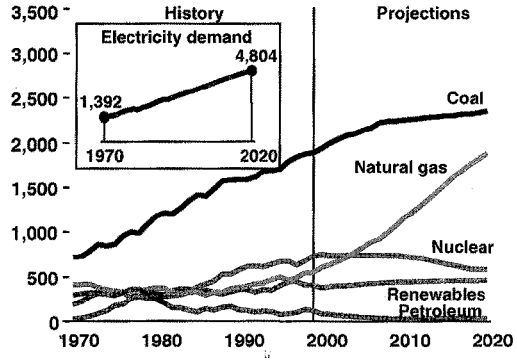


Figure 5. Nonhydroelectric Renewable Electricity Generation by Energy Source, 2000, 2010, and 2020 (billion kilowatthours)

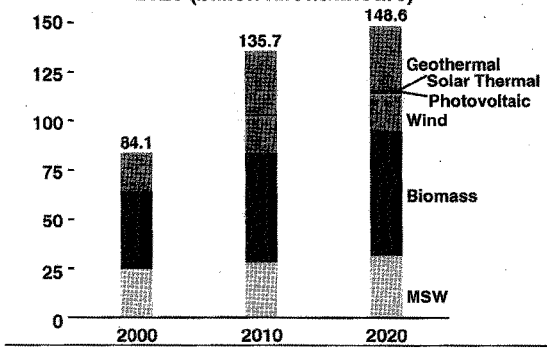


Figure 6. Projected Electricity Generation Costs, 2005 and 2020 (1999 mills per kilowatthour)

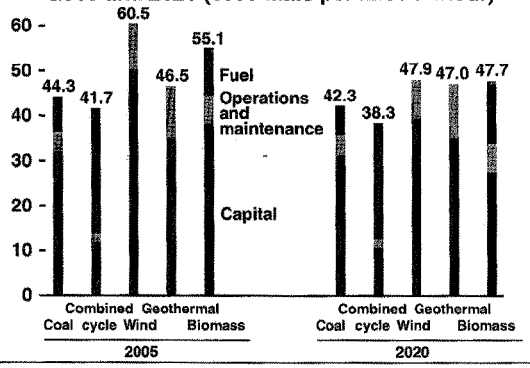


Figure 7. Nonhydroelectric Renewable Electricity Generation by Energy Source, 2000 and 2020 (billion kilowatthours)

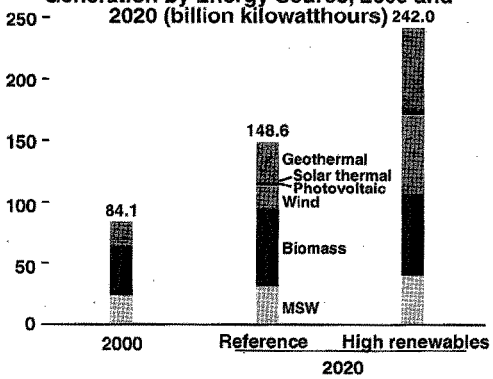


Figure 8. Projected Nonhydroelectric Renewable Electricity Generation by Energy Source in Three Cases, 2020 (billion kilowatthours)

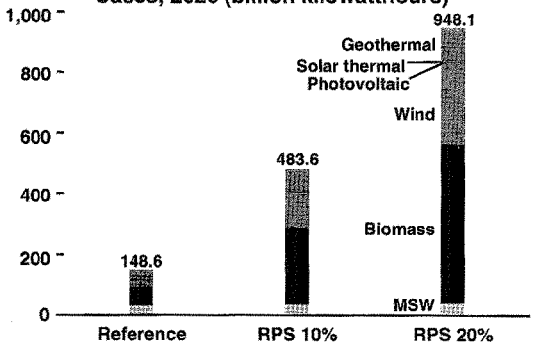


Figure 9. Cumulative Additions to Nonhydroelectric Renewable Generating Capacity by NEMS Electricity Market Module Region in the Reference and RPS 20% Cases, 2000-2020

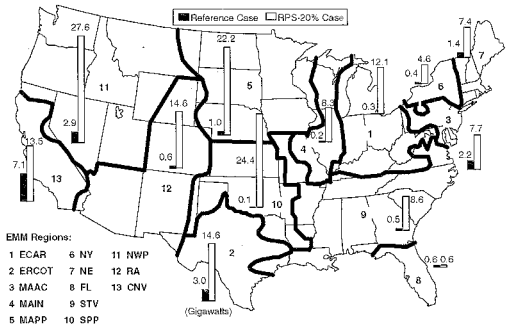


Figure 10. Projected Electricity Generation from Natural Gas and Renewable Fuels in the Reference, RPS 20% and RPS 10% Cases, 1999-2020 (billion kilowatthours)

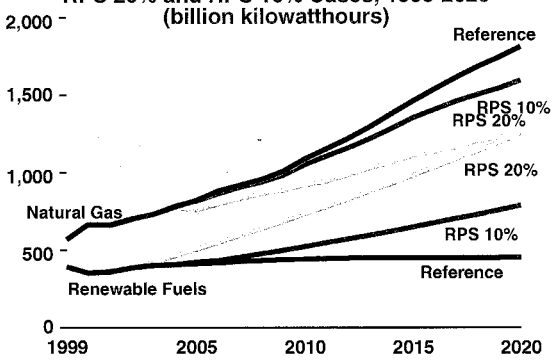
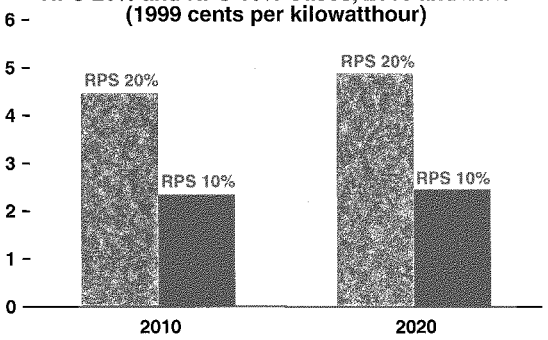


Figure 11. Projected Renewable Credit Prices in the RPS 20% and RPS 10% Cases, 2010 and 2020 (1999 cents per kilowatthour)



Mrs. CUBIN. Thank you, Ms. Hutzler.

I now recognize Mr. Garman.

STATEMENT OF DAVID GARMAN, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY, WASHINGTON, D.C.

Mr. GARMAN. Thank you, Madam Chair and members of the Committee. I am going to, with the Committee's indulgence, use some charts to summarize and illustrate my testimony. As illustrated by the first chart, our Nation enjoys abundant renewable energy resources throughout every region of the country, particularly in States with significant amounts of public lands. Developing the technologies to bring these resources into the energy marketplace is one of the fundamental missions of my office.

The second chart illustrates that our R&D programs are working to bring down the cost of generating electricity from renewable technologies. Wind technology has been reduced from 80 cents per kilowatt-hour to a current range of four to six cents a kilowatt-hour. Photovoltaic technology has been reduced from $2.00 a kilowatt-hour to a current range of 20 to 38 cents per kilowatt-hour. Geothermal power costs have fallen from 15 cents per kilowatt-hour to a range of five to eight cents a kilowatt-hour, and the price of bio-power from bio-mask gasification has fallen from 20 cents per kilowatt hour to a range of seven to 10 cents per kilowatt-hour. The potential of bio-power, bio-fuels and bio-products are of particular interest to this Committee, I would think, because forest-product residue and even the woody debris from thinning and fire prevention activities might 1 day be used to produce fuels, power and products.

Turning to the next chart, wind energy is becoming cost competitive in the very best wind resource areas. Those are the ones indicated in red on this chart. We are turning our attention to developing new turbine technologies designed to help produce power economically in areas with lower wind speeds. Those are the areas indicated on the chart in green. Success with lower wind speed turbines would bring into reach 20 times more wind resources, including those closer to the existing transmission grid and end-users, and many of these resources will be on or near public lands. Such a breakthrough would open up the opportunity to produce hundreds of thousands of potential megawatts of clean, renewable power.

As with conventional sources of energy, it is a complex and costly undertaking to secure the necessary permits for renewable energy projects on public land. The national energy policy recommended that the Secretaries of the Interior and Energy re-evaluate access limitations on Federal lands in order to increase renewable energy production. In response to the recommendations in the national energy plan—

Mrs. CUBIN. Excuse me for a second, Mr. Garman. Can you move the chart around so that we could get a better look at it? That dais is right in the way. That is good, thank you. I apologize to those of you who are behind it, but I hope you got a look at it before.

Mr. GARMAN. Just to reiterate the meaning of the chart, the areas in red are the areas where wind production is competitive

and economic today. The areas in green are where we are refocusing our R&D efforts to make wind more cost-effective in those areas.

The Department of Energy is working with our colleagues in the Interior Department to schedule a summit on expanding renewable generation on public lands, and this summit will explore both existing barriers and possible options to overcome them. My office is also supporting the National Wind Coordinating Committee, which identifies issues that affect the use of wind power. This group includes broad representation from entities at the Federal, State and local levels, utilities and consumers. My office is also working with geothermal energy stakeholders to establish a group similar to the group we have for wind stakeholders, to address, among other things, geothermal facilities siting issues on Federal lands.

The Department of Energy is also working directly with the private sector to develop renewable energy technology on DOE lands. At the Nevada test site, a private developer is working with the department to build a wind farm with a potential generation as great as 600 megawatts. This will provide us with some real-world experience in addressing some of the siting, security and land-use issues involved in letting private developers use public lands.

And finally, the White House Interagency Task Force on Energy Projects Streamlining, created earlier this year by Presidential executive order and chaired by the Council on Environmental Quality, is charged with finding ways to harmonize and expedite the review of the permitting of projects. Renewables are a key part of that task force effort. Madam Chairman, we believe there are many opportunities for renewable energy development on Federal lands, and my office will be working in concert with the other Federal agencies to promote these opportunities.

Thank you very much.

[The prepared statement of Mr. Garman follows:]

Statement of David Garman Assistant Secretary, Energy Efficiency and Renewable Energy U.S. Department of Energy

Mr. Chairman and Members of the Committee, I am David Garman, Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy. Thank you for the opportunity to discuss the potential of increasing renewable energy generation on America's public lands.

My Office promotes the greater use of renewable energy, as well as technologies and practices to use all forms of energy more efficiently. The tools at our disposal include:

- a diversified research, development, demonstration and deployment (RDD&D) portfolio supported by an annual budget of almost $1.2 billion dollars;
- our national laboratories, including the National Renewable Energy Laboratory in Golden, Colorado; and
- vital partnerships with industry, states, communities, universities, utilities, consumers, and many others.

The need to diversify our energy resources, to use our energy more efficiently, and to expand our domestic energy resources is already well understood by this Committee as evidenced by the legislation it advanced in response to the President's energy plan.

We need to use energy more efficiently and to develop more secure new domestic energy supplies, including those from clean, renewable resources.

In my testimony today I will provide a brief overview of the Department's renewable energy portfolio, discuss some of the opportunities that exist for developing this country's renewable energy resources on public lands, and share with you activities that are planned or underway to identify and address barriers to renewable energy development on public lands.

The President's National Energy Policy (NEP) released in May presented a balanced energy strategy that recognizes the importance of developing new energy supplies, including renewable energy. The NEP specifically recognizes the potential of the vast traditional and renewable resources that exist on our Nation's public lands and directs the Department and other, relevant Federal agencies to re-evaluate access limitations related to their development. We are working closely with the Department of the Interior, other relevant agencies and renewable energy industry representatives to determine the best . path forward. I will elaborate on these efforts later in my statement.

As you can see from my first chart, not only does our Nation enjoy abundant renewable energy resources throughout every region of the country, it especially does so in States with the majority of our public lands. Developing the technologies to bring these resources into the energy marketplace is one of the fundamental missions of my office. Our renewable energy programs have led to the development of advanced technologies that generate power from wind, geothermal, solar and biomass energy, as well as supporting technologies to move this power more efficiently to the end-user.

Our R&D program has helped bring down the costs of generating electricity from renewable technologies. As my second chart illustrates, we have made significant progress in this regard. Wind technology has been reduced from 80 cents per kilowatt-hour to a current range of 4–6 cents per kilowatt-hour. Today, wind projects in the best resource areas are delivering power at an unsubsidized rate of 4 cents per kilowatt-hour ... a twenty-fold decrease.

Photovoltaic technology has been reduced from $2.00 per kilowatt-hour to a current range of 20–38 cents per kilowatt-hour.

In geothermal, the cost has fallen from 15 cents per kilowatt-hour to a range of 5–8 cents per kilowatt-hour.

And in biopower, we have gone from 20 cents per kilowatt-hour to a range of 7–10 cents per kilowatt-hour.

We expect to continue to reduce costs as our RDD&D activities result in additional technology improvements. For example:

- Now that wind is becoming cost-competitive in the best wind resource areas, (those indicated in red on my next chart), we are turning our attention to developing new turbine technology designed to help produce power economically in areas with lower wind speeds (the areas indicated in green). Success with lower wind speed turbines would bring into reach twenty times more wind resources, including those closer to the existing transmission grid and end users, and many will be on or near public lands. Such a breakthrough would open up the opportunity to produce hundreds of thousands of potential megawatts of clean, renewable power.
- In geothermal energy, improvements in resource characterization and drilling and energy conversion technology could help us capture more of the estimated twenty thousand MW of high temperature geothermal resources available for electric power generation, again many near or on public lands.
- With respect to biomass, efforts are underway to develop new feedstocks and the technology necessary to economically convert the abundant domestic bioresources into liquid fuels for transportation, electricity, and bio-based products.
- In our hydropower program, we've just completed our first test of a prototype turbine designed to minimize injury to fish at hydroelectric plants. We expect the new turbine to be used for new generation capacity, and as replacements for existing turbines.

The potential of biofuels, biopower, and bioproducts is particularly important to some of the farm and forest communities of special interest to this Committee. Crop waste, forest-product residue, and even the woody debris from thinning or fire prevention activities can be used to produce fuels, power and products. The economics of biofuels, biopower and bioproducts are particularly difficult if they are pursued independently. But if pursued together through the synergistic model of a biorefinery, these conversions may come closer to economic feasibility.

The Challenges ofRenewable Production from Federal Lands

As with conventional sources of energy, it is a complex and costly undertaking to secure the necessary permits for renewable energy projects on public lands. Some of the obstacles to development identified by the renewable industry include:

- Lack of coordination and overlapping jurisdiction among government agencies with authority and responsibility for approving projects;
- issues related to development near tribal lands and sacred sites;
- uncertainty about the future land use determinations; and
- transmission easements for Federal lands.

To illustrate how important public lands may become to renewable energy production, 10 States have adopted Renewable Portfolio Standards, and two States have other renewable energy purchase requirements. The State of Nevada has adopted an aggressive Renewable Portfolio Standard requirement in its electricity restructuring legislation and, by 2013, 15 percent of Nevada's electricity will have to come from renewable resources. Since 86 percent of Nevada's lands are public lands, it is reasonable to expect that Nevada will be counting on the use of public lands for greater renewable energy production.

If we judge the responsible development of geothermal, solar, wind and other renewable energy resources to be a compatible use of multiple-use public lands, we should examine ways to streamline permitting processes. For instance, we should support efforts of our States with public lands to develop clean, renewable energy opportunities for their benefit and the good of the nation.

And we need not confine our consideration to public lands managed by the Department of the Interior and the U.S. Forest Service. Some military bases and other Federal facilities have opportunities as well. For example, the Fallon Naval Air Station in Nevada is currently soliciting expressions of interest in private development of geothermal resources on the base that we hope will become a successful demonstration.

In addition, other military or Federal lands that have contamination issues limiting the options for their reuse might be suitable for renewable energy development. We have been working on these kinds of projects in the context of brownfields redevelopment, and there will clearly be Federal applications of this model.

Following the Recommendations in the NEP

The National Energy Policy recommended that the Secretaries of the Interior and Energy re-evaluate access limitations to Federal lands in order to increase renewable energy production such as biomass, wind, geothermal and solar.

The Department of Energy is working with our colleagues in the Interior Department to schedule a summit on expanding renewable generation on public lands. This summit will explore both existing barriers and possible options to overcome them. We are currently working with the White House Council on Environmental Quality, the Department of Agriculture, Federal Energy Regulatory Commission (FERC), our Power Administrations as well as the Department of the Interior's Bureau of Reclamation, Bureau of Land Management, Fish and Wildlife Service, and the U.S. Geological Survey. We expect that numerous representatives from the environmental, financial, Tribal, and energy project development communities will be invited, as well as national, State and local elected officials from areas with large concentrations of public lands.

Also, the White House Interagency Task Force on Energy Project Streamlining, created earlier this year by Presidential Executive Order and chaired by the Council on Environmental Quality, is charged with finding ways to harmonize and expedite the review and permitting of projects that will increase the production, transmission and conservation of energy while maintaining safety, public health and environmental protection. Renewables are a key component of that task force effort.

There are other ways in which we are addressing the broad spectrum of barriers to development of renewable energy resources. The Department of Energy is supporting and participating in the National Wind Coordinating Committee (NWCC), which identifies issues that affect the use of wind power. This group includes broad representation from entities at the Federal, State, and local levels, utilities and consumers.

The Department is also working with geothermal energy stakeholders to establish a group similar to the National Wind Coordinating Committee to address, among other things, geothermal facility siting issues on Federal lands. In that connection, we have met with representatives of the Bureau of Land Management, the Forest Service, the Fish and Wildlife Service, the Minerals Management Service, state agencies, and others in laying the groundwork for that effort.

We are also working with the private sector to develop renewable energy resources on DOE lands. At the Nevada Test Site, a private developer is working with the Department to build a 260 MW wind farm. This will provide us with some real world experience in addressing some of the siting, security and land use issues involved in letting private developers use public lands.

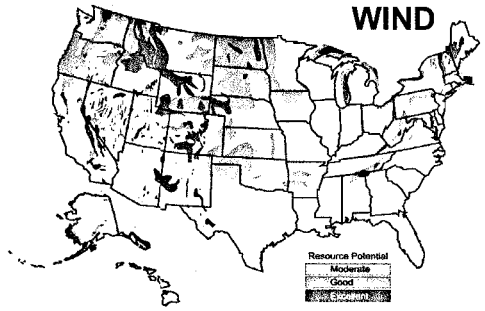
Finally, Mr. Chairman, in your letter of invitation you also requested that I discuss ocean thermal energy development (OTEC). The Department has examined the potential for OTEC in some detail. From the late 1970s through 1994, the Department conducted a research and development activity for OTEC, investing approximately $245 million in the effort. This program resulted in the construction and validation testing of small-scale OTEC systems, providing a technical base that could

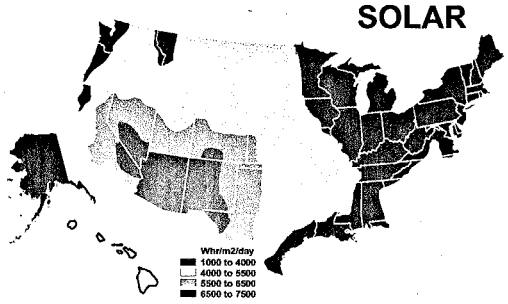
assist industry in proceeding with commercialization. Given the very narrow geographical applicability of this technology, the Department decided to end the program. However, archival information on the OTEC program can be found on the National Renewable Energy Laboratory (NREL) web site.

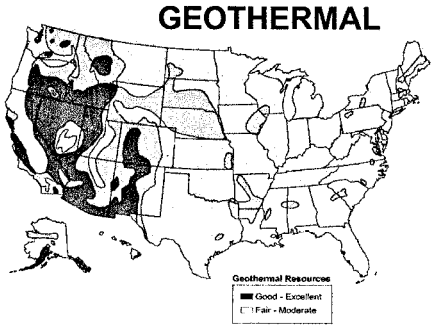
Mr. Chairman, we believe there are many opportunities for renewable energy ' development on Federal lands and my office will be working in concert with other Federal agencies as this Administration's policies are implemented.

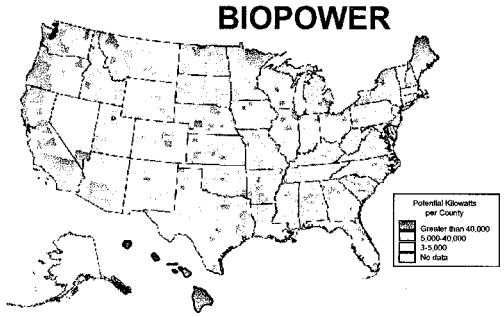
Thank you again for the opportunity to appear before the Committee and I will be happy to answer any questions.

Renewable Resources









Cost of Electricity from Renewables

Wind

1979: $0.80/kWh

2000: 4-6 ¢/kWh

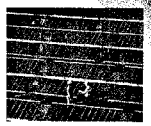
2007 Goal: 3-4 ¢/kWh

Solar

1980: $2.00/kWh

2000: 20-38 ¢/kWh

2010 Goal: 10-12 ¢/kWh



Geothermal

1985: $0.15/kWh

2000: 5-8 ¢ /kWh

2007 Goal: 3-5 ¢/kWh

Biopower

1980: $0.20/kWh

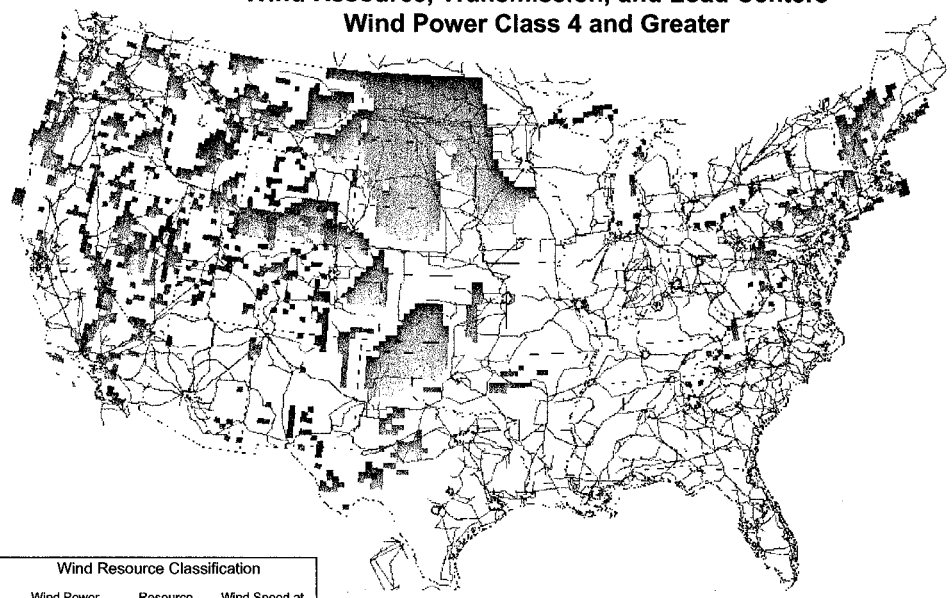
2000: 7-10 ¢/kWh

2010 Goal: 4-6 ¢/kWh

All values are stated in 2000 dollars.

Energy Efficiency and Renewable Energy

Wind Resource, Transmission, and Load Centers
Wind Power Class 4 and Greater



Wind Resource Classification

Wind Power Class	Resource Potential	Wind Speed at 10 m (mph)
4-5	Good/Excellent	13-14
6	Outstanding	15+

Transmission Line 230 KV and greater

Major Load Center

Mrs. CUBIN. Thank you, Mr. Garman.

The Chair now recognizes Mr. Griles.

STATEMENT OF J. STEVEN GRILES, DEPUTY SECRETARY OF INTERIOR, U.S. DEPARTMENT OF INTERIOR, WASHINGTON, D.C.

Mr. GRILES. Madam Chair, it is a pleasure to be before you today and the other members of the Committee. I will summarize my remarks with a short opening statement and asked that the remainder of my statement be entered into the record. Let me deviate from that, because my good friend, Mr. Rahall, has invited me back to visit with you and he today, and I just want to say to him, like most great wines, we all improve, Mr. Rahall, and we get better over time. Some of us have a different memory about facts and circumstances of certain legislative bills that are enacted and passed and who gets credit. We will not dispute this, but let's just say my memory is not like yours, and we will talk about that over dinner some night. That is my invitation to you to have dinner.

Mrs. CUBIN. Now, you boys get this settled so we can get on with this.

Mr. GRILES. Madam Chairman, thank you for the opportunity to be here to discuss the potential for production of renewable energy on public lands. As the other two speakers have said, this is a very important topic that both the President and Secretary Norton have expressed a lot of interest in and have actually taken action to support. On a personal note, let me just say prior to being confirmed as deputy secretary I represented one of the largest renewable resource companies in the United States. I was informed by them that they were the largest operators of the largest wind, solar and geothermal fields in America. So I have some practical experience in terms of what is, in fact, going on.

My experience with that company taught me that there is much to be done to improve relationships between the private sector and the Federal Government. There are barriers that we in the Federal Government must remove in order to help the renewables industry move forward. The task force that I will mention later will address many of those barriers. As some of the other speakers have said, America's energy needs, as we all know, are growing at a very rapid pace. It is very important that we have a diverse—and expand our resources that we use for energy. The increased production of renewable energy is a centerpiece of this diversification.

As you know, the development of alternative energy sources is an important component of President Bush's national energy plan. And in recognizing that, Secretary Norton, and the importance of working with energy companies and stakeholders to develop more renewable resources on public lands, the Secretary announced that the Department of Interior and Energy will host this renewable energy summit in the West this fall. DOE will be a participant, along with other Federal agencies, in this renewable energy summit on public lands as to how we can remove and address some of these barriers.

In bringing together the State and local energy leaders, and all the other interested parties, we think we can find some solutions to the barriers that have been created. Our purpose will be to

maximize wind, solar, geothermal energy production on the use of public lands by analyzing the asset limitations and other impediments that exist to the growth of renewables in terms of public lands. I think that at this time from it we will gather a lot of information, a lot of recommendations on what we can do. I think that this strategy, Madam Chairman, will augment the Nation's energy supplies that lie at the heart of the energy policy.

Conventional energy resources produced on Federal lands produce about 30 percent of the energy that the United States uses today. That is a large number. Although current production of alternate energy resources is much smaller, it is still very significant. For example, geothermal facilities using Federally-leased resources produced about 7.5 billion kilowatt-hours per year. While providing only a fraction of our overall energy production, this constitutes about 47 percent of the electricity generated for geothermal energy in the United States. Currently, wind energy is produced on BLM's California Desert, with approximately 3,000 turbines on public lands in California alone, producing enough energy for over 300,000 people.

The national energy policy had two recommendations that directly addressed the issues before us today, specifically on public lands. The national energy policy recommended that the President direct Interior and Energy to evaluate access on limitations on Federal lands in order to increase renewable energy production, which is biomass, wind, geothermal and solar. That plan also recommended that the President direct the Secretary to develop ways to reduce the delays in geothermal leasing processes, as part of the permitting review.

In response to that first recommendation, the BLM, the Bureau of Land Management, is forming an interagency task force with the Forest Service and the Department of Energy. This group will evaluate the potential of wind and solar energy production on Federal lands by identifying siting opportunities and transmission needs, as well as the impediments to making that happen.

In response to the second recommendation to reduce delays in geothermal leasing processes, the BLM has initiated a review to identify the causes of the backlogs and the processing of these leases and eliminate those backlogs. BLM has told me their goal is to eliminate these backlogs by 2003. That is their goal. My challenge and that of the Secretary is to make it quicker, sooner and still meet all the environmental necessities of ensuring that any siting is done in an environmentally-sensitive manner. But doing it quicker is something I think we can do. These procedures, when they are put in place, we believe, will accomplish that goal.

In closing, I want to emphasize the department's commitment to developing renewable energy. I must point out, however, that increased development of these resources alone will not solve our energy problems. Non-hydropower renewable energy accounts for about 4 percent of the current U.S. energy production, divided equally between electric generation and transportation fuels such as ethanol. We must make every effort to increase the contributions of these energy sources to meet the energy demands of this country. We also must increase environmentally-sensitive production of fuels, such as oil and natural gas. Until America's ingenuity

and our efforts from the private sector's viewpoint, together with new technologies and new energy sources, which DOE is involved in—we can do all of these things and have renewable energy and conventional sources working to meet this demand.

I want to thank you, Madam Chairman and Mr. Rahall, for allowing me to speak to you today. It is a pleasure to be back before you and I look forward over the next 3 years of continuing to work with you on these very, very important matters.

[The prepared statement of Mr. Griles follows:]

Statement of J. Steven Griles, Deputy Secretary, Department of the Interior

Mr. Chairman and Members of the Committee:

Thank you for the opportunity to appear before you today to discuss the potential for.production of alternative energy on public lands. This is a timely subject and one in which both the . President and Secretary Norton have expressed great interest and support. Given the current state of the Nation's energy supplies, we must devote more time and effort to fostering the development of alternative energy sources. The Secretary has stated in testimony that strategies to augment the Nation's energy supplies lie at the heart of any national energy policy. The President's National Energy Policy echoes this sentiment. It states:

> Renewable energy can help provide for our future needs by harnessing abundant, naturally occurring sources of energy, such as the sun, the wind, geothermal heat, and biomass. Effectively harnessing these renewable resources requires careful planning and advanced technology. Through improved technology, we can ensure that America will lead the world in the development of clean, natural, renewable and alternative energy supplies.

Although the current contribution of renewable and alternative energy sources is low, these sources are critical to our Nation's energy security. Their potential is made all the more attractive because of their ability to be harnessed with minimal adverse environmental impacts.

The Department of the Interior is the largest manager of the energy resources on lands owned by the Federal government. The Department is responsible for approximately 700 million acres of Federal land and 1.76 billion acres of subsurface estate on the Outer Continental Shelf. The Secretary also has trust responsibility for 56 million acres of Tribal and individual Indian lands.

Conventional energy resource production, primarily oil, gas and coal, on Federal lands provides about 30% of U.S. energy production. Although current production of alternative energy resources is much smaller, it is still significant.

For example, geothermal facilities using Federally-leased resources produce about 7.5 billion kilowatt hours per year. While providing only a fraction of our overall energy production, this constitutes about 47% of electricity generated from geothermal energy in the U.S. We recognize the potential to increase geothermal energy use as well as other alternative energy resource production on Federal lands.

Currently, wind energy is being generated in BLM's California Desert District. There are about 2,960 turbines on public lands in California producing enough electricity for about 300,000 people. Recent actions by the State of California could result in new proposals for wind energy development.

The President understands the importance of diversifying U.S. energy production by increasing the production of alternative energy resources. He has stated that this will help to reduce oil imports while at the same time reducing emissions from fossil fuel use.

The President's National Energy Policy clearly recognizes this potential. As the National Energy Policy report shows, most of the areas in the U.S. that have geothermal resources are in the western states where most of the public lands are located. The Southwest has the greatest potential for solar energy production. These states also have substantial areas of public land in which solar energy facilities could be located. The potential for use of wind to generate electricity is more widespread, but there are Federal lands in many of the most favorable areas.

The National Energy Policy has two recommendations that directly address the production of alternative energy from public lands:

- The NEPD Group recommended that the President direct the Secretaries of Interior and Energy to reevaluate access limitations to Federal lands in order to increase renewable energy production, such as biomass, wind geothermal and solar.

- The NEPD Group recommended that the President direct the Secretary of the Interior to determine ways to reduce the delays in geothermal lease processing as part of the permitting review process.

The White House Interagency Task Force on Energy Project Streamlining, created earlier this year by Presidential Executive Order and chaired by the Council on Environmental Quality, is charged with finding ways to harmonize and expedite the review and permitting of projects that will increase the production, transmission and conservation of energy while maintaining safety, public health and environmental protection. Renewable energy is a key component of that task force effort.

As a means of implementing the recommendations of the Interagency Task Force, the BLM is forming, an interagency task group with the Forest Service and the Department of Energy. This group will evaluate the potential for wind and solar energy production on Federal lands by identifying siting opportunities and transmission needs. It will assess the limitations affecting development on public lands, including the effect on wildlife habitat and the environment. When this work has been completed we will be able to report in much more detail on the extent of additional alternative energy production that might occur on public lands.

The BLM review will also identify opportunities to incorporate incentives into the permitting process. One type of incentive to be considered is the reduction of site rental fees. We will seek fee levels that provide a fair return for the use of public lands while not hindering efforts to increase energy production. The BLM plans to incorporate the group's findings into its guidance documents by the end of 2002.

In response to the second recommendation, the BLM has initiated a review to identify the causes of backlogs in the processing of geothermal leases and to develop action plans to eliminate the backlogs. BLM's goal is to eliminate the backlogs by September 2003. In addition, the BLM is examining information on the history of geothermal development to identify restrictions and impediments to development on public lands. The BLM is also developing new procedures that will reduce the time required to approve geothermal leases. H.R. 4, the Securing America's Energy Future Act of 2001, as passed by the House, includes provisions to encourage geothermal energy development by providing royalty incentives. The Administration supports the principle that the American people get a fair return on the development of energy resources from public lands while still creating incentives for the development of these resources. The Secretary already has discretionary authority to modify royalty rates if she determines it is in the best interest of the nation to do so.

Military lands also have great potential to add to our development of energy resources on Federal lands, both with respect to conventional energy resources as well as alternative and renewable resources. I have contacted the Department of Defense in order to begin to assess the energy resource of these lands. Many of the factors related to energy development, such as royalty rates, drilling procedures, and reclamation requirements are ones with which the Department of the Interior has a wealth of experience on public lands, and can serve as a model for military lands as well. Obviously, siting issues must take into consideration the national security needs of the nation as determined by the Department of Defense.

I also want to point out that while alternative energy sources are renewable and generally non-emitting, development of them does not come without any environmental impacts to the Federal lands. Alternative energy resource development may require road building, facility and other infrastructure construction, habitat modification and landscape alteration that may be similar to what is required for conventional resource development. The legitimate environmental concerns and processes that impact exploration and production of oil and gas may also impact the development of geothermal resources, which need to be drilled and piped. The same habitat concerns for plants and wildlife that accompany the installation of drilling rigs or power lines, may accompany the installation of windmills or solar panels and must be taken into account as we proceed with increased energy development on public lands.

Secretary Norton recognizes the importance of working with energy companies and other stakeholders to promote development of alternative energy on public lands. Toward this end, and in an effort to provide all interested parties an opportunity to share their views and ideas, the Departments of the Interior and Energy will sponsor a renewable energy summit that will bring together Federal, State and local officials, as well as industry leaders, interested citizens and other stakeholders, to focus on ways to maximize wind, solar and geothermal energy production on public lands by analyzing access limitations and other impediments. The purpose of the summit will be to generate discussion, gather ideas and make recommendations concerning ways to increase alternative and renewable energy resource production on Federal lands, focusing specifically on access issues and developing ways to stream-

line the application process in order to ensure consistency and promote predictability. Since Secretary Norton's announcement of this summit, several Federal agencies have requested an opportunity to participate. As a result, a Federal team has been formed which includes representatives from the Department of Energy, USDA Forest Service, the President's Council on Environmental Quality, the Federal Energy Regulatory Commission, the Tennessee Valley Authority and Department of the Interior agencies including the Bureau of Land Management, National Park Service, Bureau of Reclamation and.U.S. Geological Survey.

In closing, I want to emphasize the Department's commitment to the development of renewable and alternative energy sources. I must point out, however, that increased development of these resources alone will not solve our energy problems. Non-hydropower renewable energy accounts for about four percent of current U.S., energy production, divided evenly between electricity generation and transportation fuels such as ethanol. While we must make every effort to increase the contribution these energy sources make to the Nation's energy needs, we must also acknowledge that we continue to need increased production of conventional energy fuels such as oil and gas. We need both.

Thank you, Mr. Chairman, that concludes my prepared testimony. I would be glad to respond to any questions you or the members of the Committee may have.

Mrs. CUBIN. Thank you. I will begin the round of questioning. I would like to start with Ms. Hutzler. Do your forecasts of future energy demand in 2010 and 2020 factor in a significant reduction due to improvement in energy efficiency?

Ms. HUTZLER. Yes, we do. We have energy intensity decline in our forecast of a rate of 1.6 percent a year, and that is a measure of how energy, both efficiency and structural economy of the United States, is changing, and that is a fairly fast improvement.

Mrs. CUBIN. Did you say .6 percent?

Ms. HUTZLER. 1.6 percent.

Mrs. CUBIN. Thank you. What price for natural gas did you use in your forecast, and how sensitive are those forecasts to fluctuations in the price of natural gas, like, if it should be a lot higher in 2010 and 2020?

Ms. HUTZLER. The forecast for natural gas, during the major part of the forecast horizon, is probably somewhere just below $3.00 per thousand cubic feet at the wellhead, increasing to maybe $3.10, $3.15 per thousand cubic feet. And the forecast is very sensitive to that natural gas price. The lower the natural gas price, the less renewables you will get versus the higher the price, the more you will get.

Mrs. CUBIN. Mr. Garman, what research or technological developments appear most promising in achieving your 2007 goals for reducing the cost of electricity generated from wind and geothermal?

Mr. GARMAN. The wind goal is, in terms of the 2007 time frame—I think a lot of the opportunities that we have will come not so much from R&D, but also from addressing the barriers to allowing wind onto the grid. That is one of the key aspects. Currently, as one of the charts I had indicated, the areas that are the most promising for wind right now are distant from the load centers, they are not adjacent to where people live, they are not adjacent to where transmission lines are. The way that FERC is going to handle the integration of wind resources as an intermittent resource onto the transmission grid is going to be a pretty strong determinant of how much wind we are going to be able to bring onto the grid.

Contracts that are being let right now show good pricing for wind, excellent pricing, in the three and four cent range, but that is where access to transmission is available and that is a constraining factor to how much wind we can bring on in the short-term. Over the longer-term, of course, we hope that new R&D brings those class four areas that were shown on that map in green into the mix.

Mrs. CUBIN. You had a chart that showed the reduction in the cost of energy per kilowatt-hour, I think it was based on.

Mr. GARMAN. Right.

Mrs. CUBIN. Now, this is a real naive question to ask, but was that measuring apples to apples? It would be the cost at where you turn on the switch? So if you are comparing that cost to coal-generated or nuclear, it is where the switch is turned on and that is what the cost was?

Mr. GARMAN. No, these are generally wholesale costs delivered to the grid. That is different than the—the average industrial cost is around seven cents per kilowatt-hour today.

Mrs. CUBIN. Thank you very much. I would now switch to Mr. Griles. Oil, gas, coal and geothermal resources are leased under the Mineral Leasing Act and the Geothermal Steam Act. It also required that a royalty be paid on production. It is my understanding that under FLIPMA that alternative energy such as solar and wind can be leased, much like conventional fuels are, annual rentals are paid. However, is there a royalty paid on that production of renewables?

Mr. GRILES. Madam Chairman, you would think I would be the person to be able to answer that question. The answer is I do not believe it is. I do not think there is a royalty paid on the generation off of that, but I will submit to the record the exact answer.

Mrs. CUBIN. Well, then I am not going to go on if you think there should be, how they should be calculated. I will just submit that to you later.

Mr. GRILES. Let me say that on some of the geothermal—there are royalties paid on geothermal. I am aware that—and we are—I have directed that the Minerals Management Service review the royalty determinations and how they are calculated on geothermal, because I believe that, based on some information I received, that the geothermal royalty rates may not be conducive to encouraging the maximum opportunity for exploration and production. So we are going to look at that to make sure we do not have royalty rates that are inhibiting the utilization of geothermal.

As to wind and solar, I will look at that and look at, if we have them, whether they are appropriate or not.

Mrs. CUBIN. Thank you. My time has expired. Now I would like to ask unanimous consent to recognize Mr. Hansen, out of turn, because I understand he has to go somewhere and he wanted to make a few comments.

STATEMENT OF JAMES V. HANSEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF UTAH

The CHAIRMAN. [Presiding.] I thank you, Madam Chairwoman, and I appreciate the opportunity and I apologize to all of the members and all the people who have come here today for testimony,

but we are in kind of a topsy-turvy time right now around here, trying to keep all the balls in the air of all the events of a couple weeks ago. And I had to leave the Committee to go over and talk to Secretary Ashcroft and the FBI and the CIA and the Senators and the Speaker and everyone concerning the security of the 2002 Winter Games which will be held in Utah, which is a big issue to America right now. It is just us in Utah. So I apologize and I really appreciate you doing this. I have got to go back but, I did want to come over here and tell you how much I appreciate you coming and taking the time to be with us.

Recently, the Committee, many of us, went to Norway, Denmark and Iceland. The main reason we did is because this Committee carried a big part of the President's energy package, and as we delved into it, it seemed to us that the alternative energy sources were somewhat underutilized. Maybe we do not have the technology to get there. I understand that there will be someone from the school that I graduated from, the University of Utah, talking about geothermal—gave us a very convincing discussion about it in Iceland. It was just amazing to me that for 50 years they used coal imported from Australia, New Zealand and the States and now they do not use a drop of coal. They use geothermal and they heat the whole island. They use it for culinary purposes. They use it for energy development. They use it for various areas.

It was interesting to be in Denmark and talk to the Ministry of Energy there, and we went out and looked at all the wind turbines. I could not help but deduct how many wind turbines it would take to equal one nuclear power plant, of those that we have got in the States. It would take 662, if we took the average of our nuclear plants, 662 to equal one of those. So as I look at my little State of Utah, in Millard County, where we have one of the largest coal-fired plants, at Delta, which is called Intermountain Power Project, it would take 820 wind turbines to do it, if the wind was blowing all the time. Our problem is wind does not blow much, but when it does blow, it blows around 100 mph and that takes away from the whole thrust of the thing anyway.

So I have no argument on the idea that the 2 percent that we are getting out of these should be developed. I think it is a great idea what Iceland has done in geothermal. I think we have got an untapped source there that we can use and I support it completely. I also think of the coal that is out there. President Carter dubbed the phrase that coal is our ace in the hole. We are the Saudi Arabia of coal, basically. I think it is somewhat a shame that one of our past Presidents locked up the Kaiporawits Plateau. We did not really. We will probably open it again, had a big hand in it—what is called the lowest sulfur coal there is in the world, as far as we know. The estimates that they have given us are unbelievable, one trillion tons of coal of the lowest sulfur coal that you can find, and if that can be extracted in a way that is environmentally safe, it makes a lot of sense to me.

Basically, I came back here because I feel bad for putting a meeting together and then all of us have to run out on it, but as you know, that is how Congress works and we cannot predict the various vagaries that happen around here. We all apologize for that, but I wanted to come back and say how important it is to this Com-

mittee, my conversations with the President, what we worked out with the Senate, what we worked out with the Commerce Committee, on the tremendous importance of America having an energy policy, which I think we are on the road to doing, and we should work together in a nonpartisan way to come together with a good energy policy that we can do in an environmentally safe way, and I think we are doing that.

I appreciate the gentlelady from Wyoming, who also has a huge amount of energy sources in her State. We rob as much as we can to the State of Utah, as we did on the river situation. It is California that gets our water, and they steal it fair and square, they tell me. Anyway, with that said, let me thank all of you and I appreciate you allowing me to have a part of it. In fact, Mr. Inslee was with us on that trip that I was referring to, and could probably give a much better explanation to what we found in alternative energy sources than I could, but I thank the Chair.

Mrs. CUBIN. [Presiding.] Thank you, Mr. Hansen, for coming and for those remarks. The Chair now recognizes Mr. Tom Udall, unless Mr. Mark Udall wants to go first, or Mr. Jay Inslee outranks them both.

Mr. UDALL OF NEW MEXICO. Jay, are you ready to go?

Mrs. CUBIN. Tom?

Mr. UDALL OF NEW MEXICO. Let me ask you a question about natural gas and any of you can jump in on this, but it seems to be—and this is highlighted in some of your information—that our natural gas supplies are under huge demand, and in order to reach the projected electricity demand there is a real question as to are we producing enough, and the figures I have here is that our production on natural gas has fallen 14 percent since 1973. The New York Times recently reported, with all of the activity and most of the drilling rigs that are out there drilling for natural gas, 18,000 new wells. This is close to the highest period for drilling that we have seen in this country going back to the 1980's, and yet only a 2-percent increase in production in the last year. And so I am wondering whether this does not say to us, one, that we may not see the dramatic increases that are going to be needed to meet this demand, and shouldn't we be moving more toward renewables—towards wind, solar, geothermal and biomass much more quickly, based on these figures? Mary or anyone else there?

Ms. HUTZLER. The resource base for natural gas in this country shows that we can dramatically get more production of natural gas from the United States. The figures you are quoting really deal with what has happened recently, in terms of the fact that we saw a very low natural gas price just a year or two ago. That low price brought the rig count down, also brought down the production of natural gas, and as a result you are looking at two different issues there.

The rig count is very high now because the price was very high recently. This past winter, we had the highest prices we have seen for natural gas, and that produced the interest in production. Unfortunately, because we are moving into a recession now, that is what we are going to be forecasting for the second half of this year. And our industrial demand is very low. We have not seen the demand for natural gas.

We are now filling up our storage facilities quite high, and as a result we have seen the gas price come down tremendously. The price yesterday, I think, was about $1.80 at the Henry Hub per 1,000 cubic feet. So the issues deal with the market and, in fact, we do have the resource base to get there. We do need to have a high enough price to keep the rigs up and the drilling up to maintain it, and that price is probably higher than the $2 level that we are seeing recently, but we do look at the whole dynamics of the natural gas market, the coal market, and the renewable market when we do these particular forecast.

Mr. UDALL OF NEW MEXICO. The part of it you did not answer was when the economy was moving up, when the pressures were on and when we were doing all of this drilling, we were not seeing the kinds of increases in production, and if we return to that today, to that same level, if we are able to get out of this recession, we are not going to be producing those levels, and I think it is clear from those figures. So, I believe, and maybe this should go to the energy efficiency person from the Energy Department, it seems to say to me we have got to move to diversify in a dramatic way into renewables.

Ms. HUTZLER. I should also mention that we did do a statistical analysis during that time period when the prices were shifting, to look at the price and the relationship to exploratory and developmental drilling, and what happens is you get a lag in terms of exploratory drilling when you have very low prices, and then you need to get the additional rigs out there to get it done. This lag actually means it takes about six to 18 months before the production levels are going to get there and be commensurate; and we are there now, but it is all a matter of market dynamics, and again the resource base is there to reach these particular forecast that we are looking at in the next 20 years.

Mr. GARMAN. Congressman, I think you have hit on something very important, and that is the volatility of natural gas and some of the other prices. Traditionally, renewable energy, while it might be marginally more expensive than the fossil, those prices are relatively stable. So in the instance, in California and other areas, where natural gas prices did spike, those who made a play and hedged their portfolio of energy purchases to include a good amount of wind in that mix, saved a lot of money because they were spared from that gas price increase by virtue of the stability, inherent stability, of renewable energy prices.

Mr. UDALL OF NEW MEXICO. Thank you.

Thank you, Madam Chair.

Mrs. CUBIN. Mr. Mark Udall?

Mr. UDALL OF COLORADO. Thank you, Madam Chairwoman, and I wanted to welcome the panel and very much appreciate the detailed documents you have provided us here today, and there is a lot of food for thought. If I might direct my first question to Mr. Griles, you talked about producing the permitting backlogs for geothermal projects. My sense and my understanding is the problem may be a little broader than that, that there has been a significant increase in the time required by the BLM to process EISs before right-of-way permits can be issued for new wind, geothermal, or other projects, and I would like you to just comment if that is your

experience and your understanding, and, if so, is it because we do not have personnel or resources to get the job done, or what would you recommend we ought to do to move ahead in this arena?

Mr. GRILES. Mr. Udall, you have asked the golden question, and the answer is it requires a combination of all the things mentioned. Over the last 10 years or sooner, a lot of the employees that were dedicated to the minerals and energy programs of the Department of the Interior were not replaced as retirements and things occurred. We do not have the expertise and knowledge that we used to have, but we are having to supplant that.

A good example is within the State of Wyoming, where the Bureau of Land Management could not process the number of applications for permits to drill for coal-bed methane, but with the leadership of Congressman Cubin, we secured additional funding to do that. The same thing applies to our geothermal program. Part of the problem is that the land-use management plans that we have to rely on to make appropriate decisions on leasing do not reflect the current state of the art of where we are in terms of energy demand, whether it be geothermal, whether it be gas, or whatever the resources are.

But we have dedicated in this budget a significant increase to resource management plans so they will be updated. Most of them were signed, Congressman, when I was there in the 1985 to 1986 timetable, so for 14 years they really have not been updated to reflect the kinds of things—it takes 2 years to do a resource management plan. It takes 2 years to do an EIS. The process in and of itself is time-consuming, and that is what the applicants are faced with. Can we shorten that process? Can we improve the efficiencies of the permitting system? Yes, we can and we will try to do that. But within the context, there is a statutory requirement that we meet those kinds of things, and that is what we are trying to deal with.

We need resources to do it. We have some, getting more. We need to simplify the process. We are trying to work on that. Before you arrived—we have set up a task force within the Department of Interior, DOE and Department of Agriculture on Forest Service lands, to see what we can do to meet the environmental standards and also meet the energy requirements that are there. We welcome your thoughts, if you have some, as to how we can better do that. We will be meeting with all the participants, environmental groups, to see if there are ways we can improve that process.

Mr. UDALL OF COLORADO. Thank you. I look forward to working with you and also with Chairwoman Cubin on this important issue. I would remind the panel that whenever the chairwoman suggested she is asking a naive question, you had better be on your toes, just for future reference.

Mr. Garman, thank you again for your good work, and I want to make a comment and then ask a question. Once it is determined how much potential capacity for clean energy resources exists for development on public lands and how much would have to be sent to other markets, the question becomes do we have the transmission capacity to get this energy where it needs to go? I understand that putting up transmission lines is expensive, but if we

plan to invest in energy infrastructure anyway, we need to figure out how to solve that problem.

Would you address the issue—I know you just spoke to my cousin, my colleague from New Mexico, about this earlier, but what are we doing and what should we do in the way of R&D to bring these costs down?

Mr. GARMAN. With respect to R&D on geothermal—let's start with geothermal, right now, our success ratio when we drill a geothermal well is about 20 percent. The cost of drilling a well is around $300 a foot. Up to half of your costs in trying to develop a geothermal property involves drilling, the cost of drilling. So if you target R&D to try to bring those costs down, you can do a great deal. Our target is to get down to $150 a foot and to increase the ratio of success from 20 percent to 40 percent, and we propose to do that through a combination of technologies that involve 3-D modeling, diagnostics while drilling, a better job at resource characterization. Those are some of the tools we believe we can bring to bear to lower the cost of geothermal.

With respect to wind, of course, wind is a tricky situation. I had a chart that showed that most of the areas where wind is very competitive and economic now, is distant from both load centers and distant from transmission lines. The R&D way to approach that is to make a wind turbine that works better in the lower-speed areas, indicated by green, closer to where people live, closer to where transmission lines are, and closer to where the load centers are. So that is where our R&D emphasis on wind is turning now.

With respect to solar, bringing down the cost of photovoltaic in a distributed setting is inherently—helps the grid be more robust, because you are using it at its point of use, so you do not have to depend on the grid so much, and if you have excess power you can sell it back to the grid. So the opportunity for photovoltaics will lie in a lot with what Congress, you all, decide to do with respect to electricity restructuring, net metering, interconnection standards, and a whole host of those things that will be dealt with in the regulatory regime.

Mr. UDALL OF COLORADO. Excellent, and Madam Chairwoman, I see my time has expired, but I did want to put a plug in for the piece of legislation I introduced that would have distributed, hybrid systems in place, and I think you are familiar with it. It was included in the energy bill, and I hope you will continue to work with me as we push forward, where you would have a gasoline generator combined with a PV system or a wind system combined with another fossil fuel-based energy system, and the two can be very complementary and work in this distributed way that you mention.

Thank you, Madam Chairwoman.

Mrs. CUBIN. The Chair now recognizes Mr. Carson, who has been very, very patient.

Mr. CARSON. Thank you so much. Just a couple of quick questions.

Mrs. Hutzler, you talked about, at the very beginning of your testimony, that the 100 quadrillion BTUs we are consuming in energy every year, a certain percentage are devoted to electricity production. What was that number again?

Ms. HUTZLER. Of renewables, I said 54 percent by the year 2020.

Mr. CARSON. What percentage, though, of that—about 40 quadrillion BTUs are related to the transportation sector of our economy, I know.

Ms. HUTZLER. Yes.

Mr. CARSON. The bulk of the remaining consumption, 60 quads or so, is that related to the production of electricity, largely?

Ms. HUTZLER. It is about half of that. It is about 30.

Mr. CARSON. And the remainder of that goes to where?

Ms. HUTZLER. Other end-use sectors, residential, commercial, industrial, where they are using natural gas, oil, directly.

Mr. CARSON. Okay. In your testimony, you also mention—you talk more about problems in the wind and solar industry, the cost, some of the structural barriers to that, and you say that because they are intermittent energy sources, that perhaps at best they are going to provide, under the most optimal of circumstances, 10 to 15 percent of our electricity production; would that be a fair statement?

Ms. HUTZLER. Yes, we have talked to different people that work with renewable technologies, particularly with wind and solar, and because of their intermittent nature they prefer to have their total system only have 10 to 15 percent on them so that they can guarantee power at all times. That number, of course, can be movable as more and more experience is gained with intermittent.

Mr. CARSON. Sure. You do not talk at all in your testimony about geothermal energy—or much about that, at least. Can you tell me what structural impediments you see, if any, that exist to having geothermal energy play a bigger role in our energy consumption?

Ms. HUTZLER. Similar to what Mr. Garman talked about, first of all, with the drilling for geothermal, so you have to access it, and also the capital cost of the technology that is higher than the fossil-fired competitive technology. So that needs to come down, as well.

Mr. CARSON. Mr. Garman, you talked about, in your testimony, of the declining cost of some of these renewable sources, down now to four or five cents a kilowatt hour for wind, seven to eight cents for geothermal, as I recall, and maybe twice that for solar. Can you talk a bit about—that is the class—right now, when we are talking about the significant production of wind energy, is it from the Class 6 wind ranges?

Mr. GARMAN. That's correct. That is 15 mph annual rate of wind speed; yes, sir.

Mr. CARSON. You say it is about four to five cents a kilowatt hour in those areas now?

Mr. GARMAN. That is right.

Mr. CARSON. If we are going to move down to the class 4 and 5, which is the bulk of the country where there is significant wind resources, any estimate of what the costs per kilowatt hour of that area is?

Mr. GARMAN. Our goal by 2010 is to bring all of the wind cost unsubsidized down to that three-to-four cent per kilowatt hour rate. It is going to take an R&D investment to get that, to get lighter, cheaper turbines, to understand the atmospheric modeling a little bit, to make sure that we are putting the turbines squarely in the wind streams with the most energy, but our goal is 2010,

three to four cents a kilowatt hour, down in all areas, down to class 4.

Mr. CARSON. And would you agree with Ms. Hutzler that the capital cost of geothermal energy—that are the most significant impediment to that have a larger role in our energy consumption?

Mr. GARMAN. That is one part of it, and relevant to this Committee, my understanding with geothermal leasing, because there is a large capital cost, any delays—for instance, if you have a $10 million bonus bid on a lease, you lose the time value of that money during that time the EIS is being worked on and the record decision is being adjudicated. You layer that on top of the already-high capital costs of geothermal development and it is a significant impediment.

Mr. CARSON. Are there any other impediments? To what extent, under the most optimal of assumptions, is geothermal going to play? We talked about the structural impediments, because of their intermittent nature, for wind and solar. What can we hope for geothermal under the most optimal of circumstances in the next 20 years?

Mr. GARMAN. There was a resource assessment done by USGS in 1978, which is somewhat dated, and they estimated a potential, you know, a high-end potential of up to 150,000 megawatts. We think more in terms of useful economic—we are probably talking about a potential of 20,000 megawatt capacity of geothermal.

Mr. CARSON. What percentage of our total production would that be then, and we are converting from BTUs to megawatts to kilowatts and all that.

Ms. HUTZLER. It is about one-sixth of the total potential.

Mr. CARSON. About a sixth.

Ms. HUTZLER. Yes, in geothermal.

Mr. CARSON. Thank you all so much.

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

Mr. INSLEE. Thank you very much. I really appreciate Mr. Garman's reference to net metering. I have tried to get a net metering bill through Congress and will continue our efforts, and I encourage you to continue educating Members of Congress of how this fairly small, innocuous thing can help really spur this movement. So I really encourage you, to the extent legally allowed, educate our fellow members about how utilitarian that could be.

I wanted to ask you about the wind. I am not sure if this is your chart up here, but it says 2007 goal of three to four cents per kilowatt. We have a wind farm, I think the biggest one in the Nation, going in in Washington, I am sure you are aware, and I thought their numbers were about there now already. Tell me what you know about that.

Mr. GARMAN. There are some other costs, cost of transmission, cost of load leveling, accounting for the fact that that wind is an intermittent resource. You have to level that out with hydropower and some other things that have to be factored in.

Mr. INSLEE. So I guess what you are saying is that that would be the cost, assuming technology continues to improve and you take into consideration these load-leveling and transmission costs, and the essential cost of being intermittent. Is that what you are saying?

Mr. GARMAN. Well, no. I think the 2007 goal of three to five cents does not necessarily include all of the balancing costs and transmission costs inherent in that. That is what I might expect someone to be able to offer at the turbine, the cost of—

Mr. INSLEE. Of one kilowatt hour.

Mr. GARMAN. Yes.

Mr. INSLEE. Aren't we already there? I mean, I was talking to the folks in Denmark—

Mr. GARMAN. Right now, there is a 1.7-cent production tax credit, and this is unsubsidized costs without production tax credit. Now, I think, having said that, we will need the production tax credit to keep the installed base and the development work that is going now going. I think the production tax credit, as pointed out in the President's national energy policy, is a very important part of continuing wind development.

Mr. INSLEE. And we hope that gets continued, obviously. On solar, what sort of assumption are made? I have seen on this chart it shows a zero to 12 percent kilowatt spread.

Mr. GARMAN. That is incorrect. I think there is a mistake on that.

Mr. INSLEE. Should that be 10?

Mr. GARMAN. 10 to 12—actually, those numbers, that should be a 2020 goal, I believe. That chart is wrong, 10 to 12 cent. What we are aiming at, the real R&D holy grail right now in photovoltaic is thin-film photovoltaic, which can be manufactured—it looks almost like a sheet of plastic,and you have probably seen it. Our goal, if we can produce thin-film photovoltaic with a conversion efficiency of 15 percent, and produce it at a price of $50 per square meter and have it last 30 years, then that will be equivalent to five cents per kilowatt hour of power, and that is one of our goals, our R&D goals for the year 2020.

Now, the real value of solar is, of course, it is a peak producer, and in those areas where you have time-of-use metering, where you have net metering and interconnection standards and that whole suite of other regulatory things, the fact that solar may cost today 25 cents a kilowatt hour may not be an impediment. That may be somewhat competitive with peak power. But right now, in the current electricity structure, the consumer is shielded from price signals, and electricity that is produced at 3 in the morning is treated the same as a commodity of electricity that is produced at 3 in the afternoon. And the cost of producing that electricity are indeed very different. They are different commodities.

Mr. INSLEE. I really appreciate you bringing that up, because another part of the package we have tried to put in our energy bill is to help utilities convert to real-time pricing systems so that the consumer has adequate or accurate pricing signals to them, and there is one outfit up in the Northwest that is doing that.

Mr. GARMAN. Puget Sound Electric, yes.

Mr. INSLEE. And it has been received relatively well, and we think that is a very, very critical part of this, for the exact reason you have pointed out, to help these nascent technologies get going. The other thing is with kind of existing, I have heard it argued that for every tenfold increase in scope of production of solar, prices come down, I think, by half. Is that about right?

Mr. GARMAN. That is my understanding, as well. Right now, the solar industry is experiencing 30 percent growth each and every year.

Mr. INSLEE. If we decided to have an enormous increase in demand in solar—let's say the Federal Government made a decision to do that—is it a relatively realistic assumption that that curve would continue, as far as costs?

Mr. GARMAN. Well, that is part of the logic behind the President's proposal for a residential solar tax credit, because we think that the opportunities afforded by that residential solar tax credit—and I do not have the numbers with me today; I had it at a prior hearing—but could help bring down the costs by increasing the demand and assuring the manufacturers, unlike a Federal purchase requirement, which is dependent on appropriation, a tax credit that is going to be in place for 5 years or so sends a clear signal to manufacturers that there is going to be a demand, and they invest in capital and infrastructure they need to meet that demand, and that is, I think, a good approach.

Mr. INSLEE. Can I make just one quick comment? I know I am over time, Madam Chair, if you would give me 10 seconds. This is an editorial comment, and I appreciate the President's proposals on a lot of these renewable tax credits and the like. I think that they are on the money. I would just tell you a concern, though. All energy cost, their price is really a relative price. Whether they are purchased or used or not depends on the relative price of other energy commodities.

In the President's package, it increased the relative cost of renewable energy relative to fossil fuels, and the reason it did that is it offered enormous tax benefits to fossil fuel-based fuel sources, five to six to eight times as much as there is for renewables. I would suggest to you that that, in effect, has increased the relative cost of renewables, which we need to deal with climate change gas issues, and even though the President's plan had some visionary items in it, namely these tax things, as a package, by making clean, greenhouse gas non-emitters more costly relatively, we actually went backwards.

That is an editorial comment, and I appreciate the Chair's opportunity to let me make it. Thank you.

Mrs. CUBIN. Certainly. The Chair now recognizes Mr. Kind.

Mr. KIND. Thank you, Mr. Chairman. I ask unanimous consent to have a short statement submitted for the record at this time.

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

Mr. KIND. I commend you for holding this hearing, and I thank the witnesses and your testimony. It is very, very interesting. Earlier, in the first week of August, some of the members on the Committee had an opportunity to travel over to Norway, Denmark, Iceland, checked out the hydropower program in Norway, also their drilling in the North Sea. In Denmark, of course, it was the wind power program that they have up and going; Iceland, it was the geothermal program, but also an interesting hydrogen program that they have, to try to convert their entire auto fleet and fishing fleet to a hydrogen-powered fleet by 2010, which I found very inter-

esting, and I would be interested to hear whether the Department of Energy is looking at that specifically, and what they are doing to convert to be the first hydrogen-powered society in the world, and if there is some applicability to that type of approach here domestically.

Mr. GARMAN. We are spending roughly $110 million a year on a suite of technologies that includes transportation fuel cells, stationary fuel cells and the hydrogen program that would be needed to support that. Again, hydrogen was one of the items that was highlighted in the President's plan. We view it as a longer-term play, I think it is fair to say, than perhaps Iceland and some of the other countries do. There are significant technical challenges that stand between us and deployment—large-scale deployment of fuel cells.

In the current context of our dependence on imported oil, most of which is used for transportation, a transportation fuel cell is a very high reward proposition. It is also somewhat high-risk. But in terms of us, as we are putting our budget together, we think of it as a high-risk, high-reward proposition, and it is something that has a lot of our attention.

Mr. KIND. I am glad to hear that. Obviously, we have a different scale compared to what we need to do here in the United States, compared to Iceland, a population of about 260,000 or so. So we are not fooling ourselves in that regard. But in that context, however, I think especially in light of the events of September 11th, given the volatility in the Middle East region, given our heavy dependence on importation of oil, why can't we as a Nation at least have some studies in your departments, asking the experts on these issues to look at the feasibility of becoming energy independent, perhaps if it only entails our independence from the Middle East region as regards the importation of oil, perhaps a policy that calls for a Western Hemispheric energy policy by a date certain, and then you line up the puzzles, what steps we need to take as a society in order to achieve that weaning off of the Middle East oil and greater dependence on the Western Hemisphere, and obviously part of that equation would involve the alternative and renewable programs that we need to emphasize to a much greater degree.

Mr. GARMAN. Actually, we are, and a lot of that is happening in the context of our response to climate change. We are involved in a process right now of evaluating various technologies that could be used to reduce our demand, reduce our carbon emissions, and to integrate new technologies into the mix that would either be lower-emission or domestically produced.

Mr. KIND. Is there any comprehensive planning along those lines being done in any of the agencies right now in the executive department, how we wean ourselves off from Middle East oil?

Mr. GARMAN. What we are doing now is sort of a visioning exercise with respect to what are the technologies that we can bring to bear in the time frames to make a difference, not only in terms of—you know, mainly in the context of climate, what are the technologies we can bring to bear by, say, 2050 or sooner to address some of these concerns?

Mr. KIND. Ms. Hutzler, let me turn to you for a second. I had a chance to review some of your statement that you submitted

today, and on the second page, first paragraph, there is something a little disturbing that jumped out at me, and let me just quote what you have written here, in which you stated the share of total energy consumption that is derived from renewable sources is projected to be 7 percent in 2020, approximately the same share is it was last year.

What needs to change in order to change that projection? Do we need major policy changes in order to increase the percentage of our reliance on alternative and renewables? Do we need to change the consumption habits of our consumers, more conservation, in order to increase that equation? Let me ask you that.

Ms. HUTZLER. It is probably a combination of all those things. If you looked at other things that I have mentioned in my testimony, I talked about different renewable portfolio standards. If you require a certain amount of generation coming from renewables, you get far more renewable energy from that standpoint, in terms of a share than many of the other kinds of scenarios we look at, mainly because if you get improved R&D in renewables, you also get improved R&D in fossil fuels, as well, and it is hard for renewables to keep pace with these other technologies. They still win out on an economic basis, so you really have to do something to require the renewables to be used.

Mr. KIND. I tend to agree with my colleague from Washington State. If you just continue on the supply aspect of this equation, not so much on the demand side, we are always going to be playing catch-up in this country, as far as our appetite for fossil fuel is concerned, and that is why I think we need some very significant policy changes to deal with this trend right now.

I thank you all.

Mrs. CUBIN. When the Chairman came, he had to return back to where he was going pretty quickly, and I had not quite finished my questioning. So if the other gentlemen want another round, that would be fine, but I would like to complete the questioning that I have. I want to get this in perspective; how much we can—not just how much—but how practical it is to assume that renewables are going to make up the difference in our energy problem, are going to make us energy self-sufficient when we have trouble in the Middle East, when we cannot count on those imports. It is just not going to happen.

I want to refer to a chart that Mr. Garman had in his testimony, and it looks to me like—and I think this is important for people to notice—it looks to me like nearly all the potential for grid-connected solar power and wind power is in the Western United States, and most of the grid-connected power—most of the potential is west of the Mississippi. And, so, what potential exists east of the Mississippi? I mean, if it is not there, then transporting this small percent, 2.5 percent or 4 percent in the future of renewables east of the Mississippi, how realistic is that?

So would you expand on that, both you, Mr. Garman, and also Ms. Hutzler, if you would?

Mr. GARMAN. I think you are absolutely right. I am a fervent proponent of renewable energy, but it does not satisfy our need by itself. I am also a fervent proponent of exploration in the Arctic National Wildlife Refuge, because I think that is a transportation fuel

that we depend on. We need to develop all of our resources of energy, and we need to exploit all of our opportunities to save energy and use it more efficiently.

So I think it is important, and I think it is a fundamental precept of the President's plan, that, yes, renewables are important, but we are going to remain dependent on fossil fuels for the foreseeable future, and that is a fact.

Mrs. CUBIN. So you do not think there is much potential for renewable, other than biomass, east of the Mississippi; is that fair to say?

Mr. GARMAN. No, I do not think that is fair to say. From the wind map earlier, there are some wind areas east of the Mississippi.

Mrs. CUBIN. I am not saying any. I'm just saying a significant amount.

Mr. GARMAN. But you are right, the disconnect between population centers and where the resource is, is significant. Now, of course, with respect to transportation fuels, there are biofuels, ethanol and some other things, that have promise. They can be transported. They can be shipped. The long-term importance of hydrogen as an energy carrier is very important in this context, because that is the means by which you can take renewable energy that is produced west of the Mississippi and put it in use east of the Mississippi. But, again, that is a long-term play.

Mrs. CUBIN. Thank you very much. Do you have any further questions, Mr. Kind?

Mr. KIND. Madam Chair, I would just be brief, because I have got to run back to the floor here in a little bit, but with regards to the predictability of the tax credits and certain tax incentives that was part of the President's package and that, how important would be the extension of the wind-power tax credit in regards to that industry and the reliance on that in making some of their investment choices in this country.

Mr. Garman?

Mr. GARMAN. I view the production tax credit and an extension and a demonstration by the Congress that it intends to do a long-term extension of this as very important to the wind industry. Right now there is some $2 billion of private investment in play in wind, and that investment is there in part because of the 1.7-cent production tax credit. Were that tax credit to disappear, I think a lot of that investment would disappear, as well.

Mr. KIND. Thank you.

That is all I have, Madam Chair.

Mrs. CUBIN. I would like to thank the panel for their testimony and the answers to the questions, and we do have other questions that we would like to submit to you in writing, and would appreciate a response. Thank you for your time today, and now I would like to call the next panel forward: Mr. Jeffrey Hulen, Senior Geologist, Energy and Geoscience Institute, the University of Utah; Mr. Jonathan Weisgall, Vice President, Legislative and Regulatory Affairs of Mid-American Energy Holdings Company; Mr. Jaime C. Steve, Legislative Director of American Wind Energy Association; and Dr. Barry Lynn Butler, the Vice President and Manager of En-

ergy Products Division, Science Applications International Corporation.

I would now like to recognize Mr. Hulen for his testimony. I remind the panel that your written testimony in its entirety will appear in the record. If you could limit your comments, according to the Committee rules, to 5 minutes—

STATEMENT OF JEFFREY B. HULEN, SENIOR GEOLOGIST, ENERGY & GEOSCIENCE INSTITUTE, UNIVERSITY OF UTAH, SALT LAKE CITY, UTAH

Mr. HULEN. I am delighted to be here and to have the opportunity to share with you my knowledge of and enthusiasm for what really has to be one of our Nation's premier alternative energy resources. I am referring, of course, to clean, reliable and renewable geothermal energy. Few people are aware of how truly vast the geothermal energy resource base in this country actually is. If we are looking at resource above 100 degrees C. or 212 degrees F., accessible within just the upper six miles of the earth's crust in the United States alone, that is equivalent to the total energy contained in 2.3 million billion barrels of oil.

It is not all accessible at this point, of course, but it does represented a truly enormous untapped resource. It is about 25,000 times, in fact, the current U.S. oil reserves. Of course, at this point, as I mentioned earlier, we cannot access that entire geothermal resource base, but we think that with sufficient economic incentives, with a firm commitment to a national geothermal energy research program, with greater ease of access to public lands, as some of the previous witnesses have noted, with improved technologies to reduce the risks and cost of geothermal exploration and development, that a significant fraction of that resource, in fact, can be tapped.

Right now, as an example of the current production in this country and its potential in the future, we have an installed electrical generation capacity in this country of roughly 2,700 megawatts right now. That is generally considered sufficient for the needs of 2,700,000 households, and it offsets the production, or rather is equivalent to the combustion of 30 million barrels of oil. It is not a trivial figure.

Informed estimates as to the real potential of geothermal electric power production by the year 2010 tend to converge at 10,000 megawatts. That would be equivalent to the combustion of roughly 110 million barrels of oil per year, and by the year 2025, 20,000 megawatts. So it is a significant resource, but we believe full realization of this vast potential requires several things: first of all, as I mentioned, a firm commitment to a national geothermal research program.

At the Energy and Geoscience Institute at the University of Utah, I have been privileged to work on geothermal energy research for about 25 years now, and in part because of our findings on the fundamental nature of what are truly complex natural phenomena, we have enabled the geothermal industry to significantly reduce risks in, for example, citing geothermal wells. We would like to see that continued.

Improved technologies in drilling will also reduce the costs and risks of geothermal exploration and development, and germane to

the principal topic of this oversight hearing, greater ease of access to public lands. Geothermal operating companies really have the right to believe that if they invest literately tens of millions of dollars in exploring for and developing a resource, that should they prove up that resource and have spent that money proving up that resource, they should be able to go ahead and develop it with—there is certainly a need for reasonable evaluations of our public lands, but not to the point where they are significant impediments to geothermal research development.

Thank you, Madam Chairman, members of the Committee.

[The prepared statement of Mr. Hulen follows:]

Statement of Jeffrey B. Hulen, Senior Geologist, Energy & Geoscience Institute, University of Utah

Mr. Chairman and Members of the Committee:

I am grateful for the opportunity to share with you my knowledge of and enthusiasm for one of our nation's premier alternative-energy resources - clean, reliable, and renewable geothermal energy. The Energy & Geoscience Institute has been conducting fossil- and geothermal-energy research at the University of Utah continuously for 24 years. Our geothermal program was initiated with Department of Energy support in response to the national energy crisis stemming from the oil embargo against this country in the mid-1970s. The institute's research efforts since that time have directly and materially assisted the U.S. geothermal industry in the exploration for and development of domestic geothermal energy as one important means to help offset our growing dependence on imported fossil fuels.

The country now has about 2700 megawatts (MW) of installed, geothermal electrical-generation capacity. Annually, this amount of energy is equivalent to that obtained by combusting roughly 30,000,000 barrels of oil; it is also sufficient for the needs of up to 2,700,000[1, 2] American households. An additional 600 MW (thermal, not electrical) of geothermal energy is currently devoted to direct uses such as the heating of homes and workplaces, and the growing of flowers and foodstuffs in otherwise adverse seasons, climates, or locations. The potential for expansion of this wholly indigenous resource is enormous, but EGI believes full realization of that potential depends critically upon (in addition to greater ease of access to our public lands) a firm Federal commitment to, and increasing levels of funding for, fundamental geothermal research.

I wish to speak with you today about (1) the truly vast scope of our country's geothermal resource base; (2) the fact that geothermal resources are very complex natural phenomena, requiring particular care for informed and successful exploration and development; and (3) our conviction that a robust national research effort is essential for reducing the risks and costs of these activities, so that an ever-increasing portion of the resource will fall within economic reach.

The amount of heat stored in Earth's upper crust is a quantity of astonishing magnitude - in the United States amounting to more than 70,000,000 quads (quadrillion BTU) of energy in the upper six miles alone. For comparison, the total annual energy consumption of the United States is about 99 quads. This shallow thermal bounty is a consequence of the planet's high internal temperature (up to 7600 degrees F at the core); the natural flow of heat from the searing interior toward the surface, and rock properties of the crust that impede heat escape into space. Although just a fraction of the crustal heat budget can now be commercially produced, it remains a near-limitless energy supply that will surely become more accessible as technologies for its wider extraction inevitably improve with time.

In the near term, the bulk of our domestic geothermal production will continue to be centered in the American West. Here, heat is concentrated at the thermally, seismically, and in places volcanically active margin of the North American tectonic plate. As shown on the map (Figure 1), virtually all the West's (indeed, the country's) high-temperature (nominally greater than 300 degrees F) geothermal fields and promising prospects are situated in regions with much higher than normal heat

[1] - Energy & Geoscience Institute, 2001, Geothermal Energy - Clean, Sustainable Energy for the benefit of Humanity and the Environment, 8 p.; commissioned by the Department of Energy, Office of Wind and Geothermal Technologies (Document Attached) [This Document has been retained in the Committee's official files.]

[2] - U.S. Department of Energy, Office of Geothermal Technologies, 1998, Strategic Plan for the Geothermal Energy Program, 23 p.

flow. In these areas, steam and hot water from the subterranean fracture networks of natural hydrothermal systems can be harnessed to generate electricity with minimal impact on the environment. Lower-temperature (less than 300 degrees F) hydrothermal systems yield hot water for direct-heating applications as diverse as fish farming (aquaculture) and the drying of crops and bricks.

It is widely believed that expansion of existing high-temperature geothermal resources and discovery of others could increase our current geothermal electric-power production capacity to 10,000 MW by the year 2010[2]. By analogy, geothermal direct-heating installations could likely provide 2400 MW by the end of this decade.

In the longer term, given sufficient economic impetus, evolved technology, improved scientific knowledge, and better public-lands access, it is estimated that high-temperature geothermal resources in the western U.S. could supply more than 20,000 MW of electrical energy within 20 to 30 years.[2] Toward achieving this goal, there is still a great deal about natural hydrothermal systems to be learned through basic research, for the more we know about these systems, the more readily and cost-effectively they can be found, developed, and expanded.

Several of the West's high-temperature geothermal systems (for example Desert Peak in Nevada) have no obvious surface manifestations, and it is virtually certain that many other such wholly concealed systems await discovery in the region. In order to narrow the search for these elusive yet potentially valuable systems, we need to focus on subtle clues to their hidden presence that certainly remain to be gathered. Researchers at EGI and elsewhere, for example, are making great progress toward that end by developing new methods for sophisticated analysis of satellite and high-altitude aircraft imagery over the concealed systems already in production.

Experts are also confident that conventional geothermal resources can be engineered to yield even more of their precious energy. It is now well established that these systems are limited not so much by heat as by the amount of fluid and the number and size of fractures along which the fluid can circulate and absorb that heat. Stated another way, there are far more high-temperature heat sources than natural, high-quality hydrothermal systems. Department of Energy-sponsored research both planned and in progress is aimed at enhancing such systems artificially by creating new subsurface fracture networks and by injecting additional fluid into those networks through deep boreholes.

In addition to producing electrical energy, some geothermal fluids can also be "mined" for valuable metals and minerals. Several companies, for example, are investigating silica production from geothermal brines. At the Salton Sea field in California's Imperial Valley, the brines are already yielding substantial quantities of high-purity zinc. The amount of the metal to be recovered is by no means trivial, at 30,000 tons per year. Not only will this zinc-from-brine extraction enhance the profitability of electric-power production at the Salton Sea, it will also benefit the environment by offsetting the need for conventional smelters and mines.

Although public-lands policies clearly affect geothermal exploration and development more directly than research, I would like to address briefly the obvious need for (1) the easing of access to public lands and (2) the reduction of bureaucratic impediments to the timely development of geothermal (and other natural) resources once discovered on those lands. About three-fourths of our current geothermal electric power is produced from public lands, and future discoveries will certainly be concentrated there—the accompanying geothermal and land-use map of Utah (Figure 2) should serve to demonstrate the point. Restricted rights-of-entry and multiple, lengthy, and often redundant pre-development land-use assessments all too often have proven so costly that legitimate, nationally beneficial, commercial development of domestic natural resources has been rendered an impossible task.

Research supported by DOE and the geothermal industry has advanced significantly since the U.S. Geological Survey (USGS) in 1978[3], and even since Gawell, Reed, and Wright (1999)[4], last surveyed the geothermal resource potential of the nation's public lands. We believe, with others, that the time is right for a new assessment, using the most up-to-date techniques and conceptual models possible, to be carried out by the USGS in close collaboration with University-based and other geothermal research groups.

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[2] - Department of Energy, Office of Geothermal Technologies, 1998, Op. Cit.

[2] - Department of Energy, Office of Geothermal Technologies, 1998, Op. Cit.

[3] - U.S. Geological Survey Circular 790, 1978, Assessment of Geothermal Resources of the United States, 163 p.

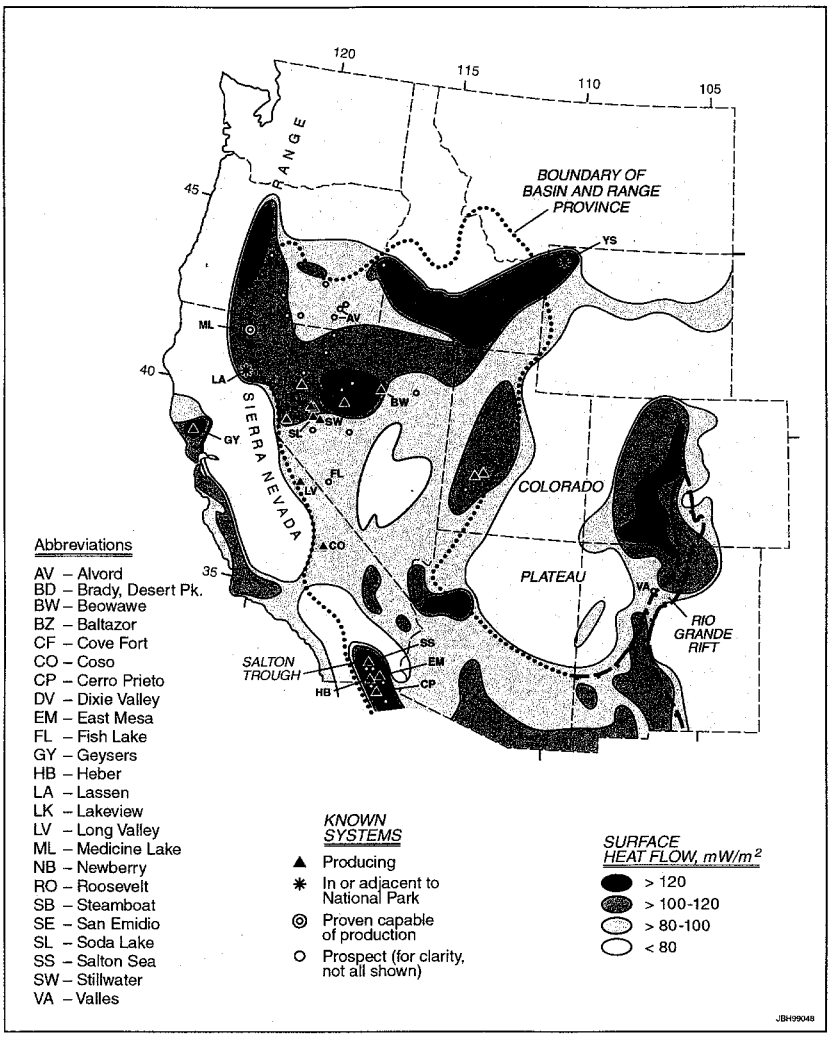
[4] - Gawell, K., Reed, M., and Wright, P.M., 1999, Geothermal Energy, the Potential for Clean Power from the Earth: Geothermal Energy Association, Preliminary Report.

In summary, it seems clear that our country can only benefit by taking full advantage of our fortuitous geothermal wealth. The U.S. is blessed with vast geothermal potential, optimum realization of which, stemming from a vigorous national research program, will diminish our dependence on fossil fuels, and significantly strengthen our vital national energy security.

[Maps attached to Mr. Hulen's statement follow.]

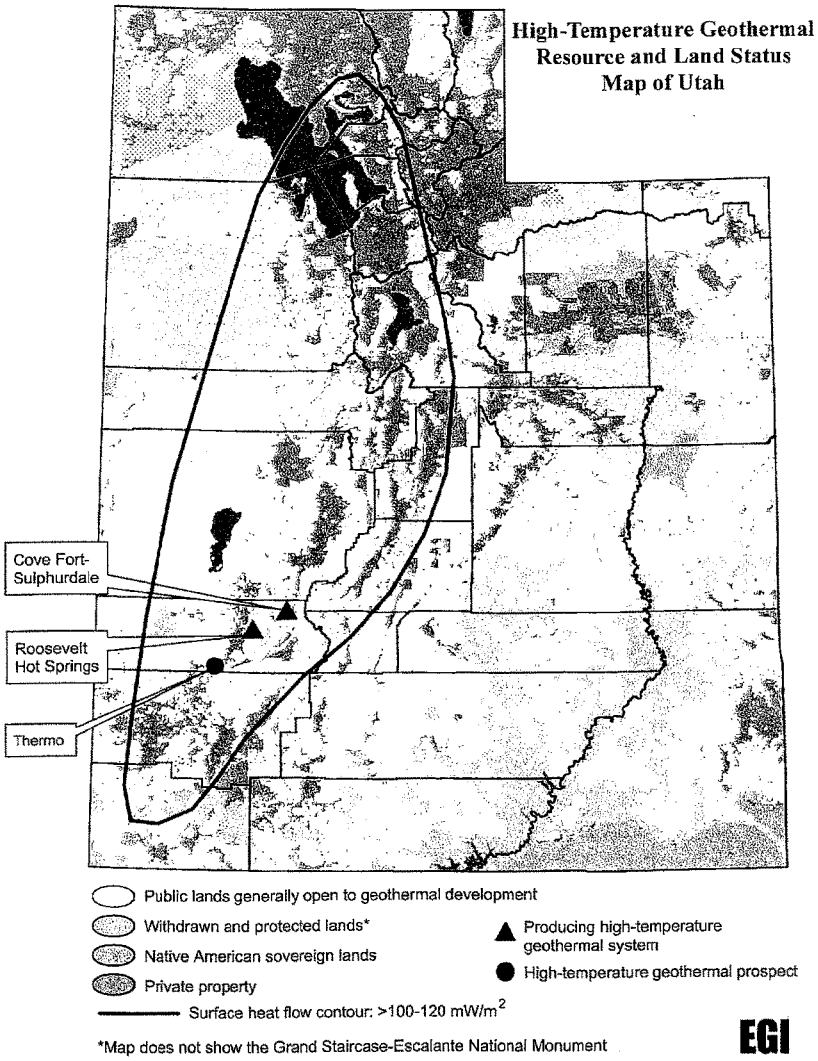
[The attachment entitled "Geothermal Energy: Clean, Sustainable Energy for the Benefit of Humanity and the Environment" is retained in the Committee's files.]

Figure 1



High-temperature (>150°C, or 300°F) hydrothermal systems of the western United States. Heat flow mapping from Wisian et al., 1999.

Figure 2


High-Temperature Geothermal Resource and Land Status Map of Utah
Cove Fort-Sulphurdale
Roosevelt Hot Springs
Thermo
Public lands generally open to geothermal development
Withdrawn and protected lands*
Native American sovereign lands
Private property
Surface heat flow contour: >100-120 mW/m2
Producing high-temperature geothermal system
High-temperature geothermal prospect
*Map does not show the Grand Staircase-Escalante National Monument
EGI

Mrs. CUBIN. Thank you, Mr. Hulen.

The Chair now recognizes Mr. Weisgall.

STATEMENT OF JONATHAN M. WEISGALL, PRESIDENT, GEOTHERMAL ENERGY ASSOCIATION; AND VICE PRESIDENT, LEGISLATIVE AND REGULATORY AFFAIRS, MID-AMERICAN ENERGY HOLDINGS COMPANY, WASHINGTON, D.C.

Mr. WEISGALL. Thank you, Madam Chair. I am Jonathan Weisgall. I am the vice president with Mid-American Energy Holdings Company. I also served as president of the Geothermal Energy Association. We are about 83 companies involved in U.S. geothermal development. Mid-American has a utility in Iowa. We have got a utility over in the UK, and then we have a division called CalEnergy, which is involved—really, we have got hydro, we have got solar, but we really concentrate primarily on geothermal in the western United States, Utah—I am sorry the Chairman left-and California, and also over in the Philippines. We have got about 340 megawatts of geothermal in California alone, down near the Sultan Sea; 30 seconds of unadulterated political pandering, but thank you, Madam Chair, for your work earlier this year on chairing that hearing on geothermal issues. I think that was very helpful.

You have heard a lot of facts about renewables today. I will leave you with one factoid. Geothermal energy produces 6 percent of California's electricity. That is a lot. We, as producers, have paid over $600 million in rentals and royalties and bonus bids to the Federal Government over the years, not counting Federal income taxes. If you throw that in, you are looking at about $4 billion, not counting multiplier effects.

The potential you heard from Mr. Hulen, going from about 2,600, 2,700 today, probably up to 10,000 or 20,000 megawatts. It can be done, probably about half of that or more, on Federal lands. I do not want to be the elephant at the cocktail party, but I have got to tell you that geothermal energy development on public lands has declined rapidly. It is real tough as a private developer, when we have got the alternative of developing geothermal on leased lands that are held in fee simple down at the Sultan Sea or on public lands that I am going to tell you about, it is a lot easier not to go Federal. Sorry to report that, but that is the fact.

Where do start in geothermal? Well, you have got to define your resource before you can even get financing. Your heard Mr. Garman and he is right; your average geothermal well is around $2 million and your success rate is not too good. Well, before you even go at that risk, you need a lease. That is bureaucratic problem number one. Federal agencies are taking years to act on tens of thousands of acres of leases, 250,000 acres in Nevada under geothermal lease application, BLM does not have the resources. Washington State, one application pending for 11 years. There is a long list. So no lease, no exploration; that is problem one.

Number 2, once you build the lease, you have then got these other questions of permits, the environmental review. I will quickly tell you about one of our projects up in Northern California called Telephone Flat. BLM, with the approval of the Forest Service, issued these leases under the Geothermal Steam Act. They were leased lands to develop geothermal energy. Bonneville Power was

going to buy the power, California Energy Commission supported his.

The finally EIS came out and BLM and Forest Service said yes, let's go forward with some mitigation measures, and then they changed their minds and issued—they simply denied the project. We are in court now, in the Court of Federal Claims, as you can well imagine. Let me just tell you there were a number of factors, a number of policies at work that you all deal with every day, protecting roadless release areas, protecting the rights of Native Americans, protecting spotted owl issues and encouraging renewable energy.

To make a long story short, renewable energy lost big. Another company, CalPine, is going forward up there. I think they told you at a hearing this spring if they had known back in 1984 what they know today, they would not have gone forward. What is needed? Federal energy projects on public land need to be given more priority, greater sense of urgency. You have asked some of that already of the witnesses, but the bureaucratic delays have to go away.

A company like ours that can build a geothermal plant in a couple of years down at the Sultan Sea—and by the way we are going to double those facilities and more. We are looking at another 340 megawatts down there, and we can do that quickly. Yes, you still have the applications. You have got the State of California. You have got the bureaucrats, but they move faster than the Federal ones.

You have got to eliminate duplication. The CalPine proposal was held up repeatedly while different Federal and State agencies looked at the same issues, sometimes several times over. You have got to strike a more reasonable balance on the need for renewable energy and other uses of public lands. Where we came out on our project was the Federal agencies wanted no impact. Well, that is a pretty high bar. You can take all kinds of mitigation measures. To have no impact when you are building a power plant, even a clean, renewable one, that is tough.

There are military land issues. You could amend the Geothermal Steam Act to put military lands under that. H.R. 4 is doing some of that. There are huge opportunities, Madam Chair, to increase energy diversity, and it is primarily in the West. The map made very clear that is where the resource is. Do not squander this opportunity. You have really got to work on the bureaucratic red tape. We are bullish on geothermal as a company, but I will tell you honestly we are not bullish on the Federal land aspect of geothermal unless major changes are made.

Thanks very much.

[The prepared statement of Mr. Weisgall follows:]

Statement of Jonathan M., Weisgall, President, Geothermal Energy Association

Mr. Chairman and Members of the Committee: Thank you for the opportunity to present the views of members of the Geothermal Energy Association (GEA) to this Committee regarding geothermal energy potential on public lands and the obstacles to developing this important national energy resource. GEA is a 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.

MidAmerican Energy Holdings Company consists of four major subsidiaries: MidAmerican Energy Company, an electric and gas utility based in Iowa; a U.K. utility; a residential real estate company; and CalEnergy, a global energy company that specializes in renewable energy development, primarily geothermal, in California and other Western states, and in the Philippines. We own and operate 340 megawatts of geothermal electricity in the Imperial Valley in Southern California, where we are the largest employer and taxpayer in Imperial County, which is one of the most economically disadvantaged counties in California.

GEA wrote Vice President Cheney in May urging him to include in his upcoming Task Force Report recognition of the problems facing geothermal energy on public lands. A copy of that letter is attached to our testimony. (Attachment 1)

We were very pleased to see the Energy Policy Task Force's report include specific recommendations on geothermal energy, and we urge the Department of the Interior to act quickly to implement them. In addition, we have been encouraged by the interest of this Committee's Subcommittee on Energy and Minerals, shown at the oversight hearing held by Chairwoman Cubin in May that focused on the problems facing geothermal developers on public lands. We appreciate your concern about these impediments.

Geothermal Energy's Potential

Geothermal energy provides a significant amount of the energy and electricity consumed in the Western U.S. Geothermal heat supplies energy for direct uses in commercial, industrial and residential settings in 26 states. Geothermal resources furnish substantial amounts of electricity in California, Nevada, Utah and Hawaii. Indeed, 6 percent of California's electricity comes from geothermal energy. Expanded use of these resources will provide additional 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.

Geothermal energy 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 Princeton 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 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 efforts of the U.S. Geological Survey ("USGS") and the Department of Energy to define the U.S. resource base have not been funded for many years. As the USGS pointed out in its testimony before the Energy Subcommittee in May, the last assessment it conducted was undertaken roughly 30 years ago.

In order to produce a more current picture of the near-term potential of the geothermal resource base, GEA Executive Director Karl Gawell together with Dr. Marshall Reed of DOE and Dr. Michael Wright of the Energy and Geosciences Institute at the University of Utah, conducted a systematic survey of known experts in 1999. The results of this survey were assessed and a brief report was released in April of that year entitled "Preliminary Report: Geothermal Energy: The Potential for Clean Power from the Earth."[2]

That report concluded that the U.S. geothermal resource base could support significantly increased production. U.S. geothermal electric capacity, now at about 2,600 MW, could almost be tripled and, with expected improvements in technology, could reach nearly 20,000 MW in 20 years.

These figures would appear to be fairly consistent with the estimates presented to the Subcommittee on Energy and Minerals by the USGS. Their testimony indicated a potential for 22,290 MW of geothermal electricity production (see Attachment 2). As GEA's Executive Director testified before the Energy and Minerals Subcommittee, this is in line with the results of the planning workshop that helped produce the current DOE Strategic Plan - an effort that brought together many of the leading experts from industry, laboratories and academia. At that workshop,

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

[2] Gawell, Reid and Wright, Preliminary Report: Geothermal Energy, the Potential for Clean Power from the Earth, Geothermal Energy Association, April 7, 1999

there was a consensus that with market support as much as 10,000 MW of electric capacity could be brought on-line in the West by 2010.[3]

Achieving this additional geothermal production would have substantial economic and environmental benefits in the western United States. If the goal of the DOE Strategic Plan could be reached, the cumulative Federal royalties from the new power plants would reach over $7 billion by 2050, and estimated income tax revenues would exceed $52 billion in nominal dollars.[4] Just the state share in these royalties alone would mean an additional investment of $3.5 billion in schools and local government facilities in the western states.

Geothermal Energy on Public Lands

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. If we expect to see significant increases in geothermal energy production, it will have to involve resources yet to be developed on public lands. But that will not happen without significant changes in the administration of geothermal leasing, environmental assessment, permitting, and other actions by Federal agencies.

New geothermal development requires the timely and reasonable oversight of Federal leasing, permitting, and environmental reviews by public land management agencies. Unfortunately, the administration of geothermal energy on public lands has been marked by bureaucratic delay and indecision by public land agencies; as a result, there has been a rapid decline in new geothermal energy development.

To understand the impact this has, it is important to recognize that all of the estimates discussed earlier are nothing more than that - estimates. A company interested in developing a geothermal resource will have to invest millions of dollars in defining the resource before construction of a power plant can even begin. Unfortunately, there are few surface exploration techniques for geothermal energy that can provide any degree of confidence. Confirmation and definition of the resource involves drilling, and that means that the resource risk is high and may remain high until after several wells have been drilled.

Geothermal wells are more expensive to drill than oil and gas wells. They are drilled in hot, hard, fractured, abrasive rocks where problems are frequent and expensive. For a green field development, resource definition work may involve as much as 40% of the cost of the project, and that considerable expense must be borne before the resource is confirmed sufficiently to secure financing for a project - making the risk to the developer even greater.

Companies will not take on such considerable expense and risk without assurance that if they are successful they will be able to develop a power plant. To begin with, they need a lease to ensure their rights to develop the particular resource identified. This brings us to bureaucratic problem number one: tens of thousands of acres of geothermal leases have been applied for in the West, but no action has been taken by Federal agencies, often for years.

In state after state there continues to be a de facto moratorium on geothermal development on public lands as agencies fail to take timely action on lease applications. Based upon the feedback we have received from GEA member companies, we understand that in Nevada, for instance, there are presently over 250,000 acres under lease application most of which have been pending for over a year.

Companies have been told by BLM that it does not have the resources to complete action on these lease applications. Even if companies offer to pay for consultants to assist the government with their lease application reviews, they are told it will take nearly a year to process an application.

Similar stories are told in other states. One company has had lease applications pending on over 10,000 acres in Washington State for 11 years. In New Mexico, another company reports that it has had 20,000 acres of lease applications in limbo for over 3 years. A company in California reports that 18,000 acres of lease applications have been in process for about 6 years.

If you wonder why there are not more geothermal projects being developed in the West, this is a big part of the answer. If a company cannot obtain a lease, it will not spend millions of dollars on the exploration needed to determine whether or not there are adequate subsurface geothermal resources to support a geothermal power project.

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

[4] Princeton Economic Research Inc., Op. Cit., Volume I, page 17.

Furthermore, once a company obtains a lease, the administrative processing of permit applications and environmental reviews can be expected to take years of additional time. As GEA's Executive Director testified before the Energy Subcommittee, it has been our members' experience that "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."

The CalEnergy Telephone Flat Geothermal Development Project is another example of the severe obstacles encountered in attempting to bring alternative energy resources into production on federally administered public lands. This project is located on national forest lands in northern California, in the area identified by the Federal government as the Glass Mountain Known Geothermal Resource Area ("KGRA"). The project consists of a 49 MW power plant with associated well fields, transmission lines, and other facilities to produce and use geothermal steam included in Geothermal Steam Act leases.

The BLM issued these leases in the 1980s, with the approval of the Forest Service, for purposes of this development. The project is sited in a demonstrated area of commercial geothermal steam production within the KGRA, situated in what is known as the Medicine Lake Caldera. The BLM and Forest Service encouraged this development in the Glass Mountain area for twenty years. The Bonneville Power Administration agreed to buy power from the project once it was approved by these agencies, and the California Energy Commission's Renewable Energy Program awarded funding to CalEnergy to encourage the development.

Between 1997 and early 1999, CalEnergy and the agencies completed a detailed environmental impact statement ("EIS"), addressing the potential impacts of the project. In the final EIS, the agencies chose to proceed with the project with appropriate mitigation measures as the preferred alternative. However, after millions of dollars of investment by CalEnergy and after issuing the final EIS, the BLM and Forest Service then reversed their position. They denied the project in a May 31, 2000 Record of Decision.

In their decision, they made it clear that they would not approve any development in the Caldera area, citing concerns about perceived effects of the project on Native American spiritual use and recreation. The denial of the Telephone Flat Project by the BLM and Forest Service is now the subject of a contract breach and Fifth Amendment taking lawsuit against the United States, in which CalEnergy is seeking substantial damages. I cannot comment further on this matter because it is in litigation. However, the sequence of events that I have described illustrates the disincentives to development that currently exist.

During the Subcommittee hearing last May, an official from Calpine Corporation, the largest geothermal energy company in the United States, testified about his company's experience trying to develop geothermal resources at another site in the Glass Mountain KGRA. Calpine reached a different result from my company, as the Forest Service and BLM approved their project. Despite this positive outcome, the Calpine official declared in his statement before the Subcommittee "...if Calpine knew in 1994 what is knows now, it is safe to say that it never would have invested its time and capital in the Fourmile Hill project." He continued: "...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 resources."

The message is clear: Extensive and expensive administrative processing is having a significant negative impact on geothermal development on public lands. The years of delay and uncertainty in moving forward at these sites sent shock waves through the geothermal industry. It sent a message to every company even thinking about a new geothermal project on public lands—expect many years of arduous and expensive bureaucratic processing.

Geothermal Energy on Military Lands

In addition, there are millions of acres of public land in the West that are reserved for use by the military. These lands potentially hold significant geothermal resources, but there are no consistent procedures for obtaining leases on military lands, and industry's limited experience to date has not been completely positive. In particular, the lease terms and conditions at the existing geothermal power site have posed both economic and operational problems for the company involved. .

Private companies should be encouraged to develop geothermal resources on these lands in a manner consistent with their primary function and military mission. As Ross Ain, Vice President of Caithness Corporation, testified before the Sub-

committee on Energy and Minerals, we have specific recommendations to promote this goal. Specifically, for geothermal leasing and development on lands subject to military reservation there should be:

(1) Uniform policies on securing and maintaining the leasehold estate, except as dictated by military needs;
(2) Uniform royalty structures; and
(3) Centralized administration of the lease and royalty programs.

Essentially, we believe geothermal resources on military lands should receive treatment similar to other minerals.[5] The Resources Committee has reported legislation as part of H.R.4 that would greatly advance achieving more geothermal production from military lands. We commend the Committee for its action.

Recommendations

It is important that the Subcommittee recognize that 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:

- Ensure that the processing of needed, clean energy projects on public lands is handled with a sense of urgency and priority. It is vital that bureaucratic delays be reduced from years to months, if not weeks, and that the backlog of appeals at the Interior Board of Land Appeals be eliminated.
- 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.
- Amend Federal law to place geothermal leasing on military lands under the Geothermal Steam Act, subject to consultation with the Department of Defense.

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.

Thank you.

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[5] See 43 U.S.C. 158. The Engle Act of 1958 placed mineral resources on withdrawn military lands under jurisdiction of the Secretary of the Interior and subject to disposition under the public land mining and mineral leasing laws.

ATTACHMENT #1

GEOTHERMAL ENERGY ASSOCIATION

209 PENNSYLVANIA AVENUE SE, WASHINGTON, D.C. 20003 U.S.A.

PHONE: (202) 454–5261 FAX: (202) 454–5265 WEB SITE: WWW.GEO-ENERGY.ORG

April 5, 2001

The Honorable Richard B. Cheney
Vice President of the United States
The White House
1600 Pennsylvania Ave.,NW
Washington, D.C. 20500

Dear Vice President Cheney,

As your task force examines the issues facing America's energy security, we hope that you will consider the obstacles and inordinate delays facing geothermal energy development on public lands.

Geothermal energy provides a significant amount of the energy and electricity consumed in the Western US. 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.

Today, about 75% of US 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.

For the geothermal industry, the events surrounding development in California's Modoc and Klamath National Forests have been a chilling demonstration of why any sensible geothermal company would not 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 enactment of the Geothermal Steam Act in 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.

After environmental reviews and some exploratory drilling, Calpine Corporation submitted the first plan of operations for construction of a power plant in 1996. Another environmental review ensued, and an extensive Environmental Impact Statement was finalized on September 25, 1998. However, it was not until nearly two years later, May 31, 2000, that a Record of Decision was issued to approve the Project—and then only after imposing through the ROD some of the most restrictive conditions ever imposed upon an energy project on public lands. But the story doesn't end there. After the ROD was issued, it was appealed to the Interior Board of Land Appeals where a decision is expected sometime in the next couple of years.

Meanwhile, further exploratory drilling has been blocked pending a decision on the appeal, even though such drilling had been previously approved and permitted.

The treatment of the Calpine project at Fourmile Hill has 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.

It is important that your Task Force recognize and address the 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 encourage your task force 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.

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 by this Administration 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 better familiarize you with the issues specific to this important geothermal resource area, I have enclosed an article that I recently wrote about the Calpine project at Fourmile Hill and its potential for providing new energy to California and the West.

The present energy situation in the western US 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 your Task Force to seek ways of clearing the logjam that prevents geothermal from contributing fully to our nation's energy security. The Geothermal Energy Association and its membership would gladly provide assistance to your Task Force on this matter, or any other issue related to development and use of geothermal resources.

Sincerely,

Karl Gawell
Executive Director

cc: Secretary Gale Norton
Secretary Ann M. Veneman

Attachment #2

GEOTHERMAL ELECTRIC PRODUCTION POTENTIAL

Alaska	250 MW
Arizona	1,000 MW
California	12,000 MW
Hawaii	250 MW
Idaho	540 MW
Montana*	400 MW
Nevada	2,000 MW
New Mexico	2,700 MW
Oregon	2,200 MW
Utah	1,350 MW
Washington**	300 MW
TOTAL	22,990 MW

*Montana was not included in the USGS estimate. This estimate was provided by Dr. John Lund of the Geo-Heat Center at the Oregon Institute of Technology.
**Washington state was not included in the USGS study - this estimate was provided by Prof. Gordon Bloomquist, Director of the Energy Program, Washington State University and it is believed that there is much greater potential in the state that has not yet been tested.

Mrs. CUBIN. Thank you, Mr. Weisgall.

The Chair now recognizes Mr. Steve.

STATEMENT OF JAIME C. STEVE, LEGISLATIVE DIRECTOR, AMERICAN WIND ENERGY ASSOCIATION, WASHINGTON, D.C.

Mr. STEVE. Madam Chairwoman, my name is Jaime Steve and I am Legislative Director for the American Wind Energy Association, based here in town. Wind energy development companies that I represent include Enron Wind Corporation, based in California, and FPL Energy, a subsidiary of Florida Power and Light, based in Juneau Beach, Florida. Increased use of clean, domestic wind energy on both public and private lands is a bipartisan issue with broad support in the Congress and from the Bush administration.

For example, a 5-year extension of the wind energy production tax credit that we heard about earlier is contained in H.R. 4. It is also part of the Bush-Cheney energy plan. A freestanding 5-year extension of that tax credit, introduced by Representative Mark Foley, has attracted about 150 sponsors at this point and continues to grow. An identical freestanding Senate bill by Senator Grassley and Senator Conrad has about 26 sponsors.

While the tax credit is crucial to wind energy development and it is likely to be extended this year, it may be extended for a period of less than the full 5 years needed to provide the stability and certainty required for long-term investment decisions. By the end of this year alone, Texas will see more than 800 megawatts of wind power come online. This amount of electricity is enough to meet the annual electricity needs of about 200,000 homes.

At the same time, hard-pressed Texas farmers and ranchers leasing small portions of their land for wind development will gain annual payments in the range of about $3,000 per windmill per year for a period of 20 years. Let me repeat that: $3,000 per windmill per year for a period of 20 years. So that adds up for farmers and ranchers. A simple point is that wind energy is real and it is spurring significant economic development in rural America.

Today I would like to specifically address two issues affecting the ability to develop wind energy on Federal lands. The first one, and we have heard about this before, significant delays by the Bureau of Land Management in processing environmental impact statements. While I am not here to beat up on the BLM, I must point out that in the last 2 years there have been significant increases in the time required to process environmental impact statements. These are important because you have to get through these before you actually site a facility.

What used to take six to 9 months now routinely takes 18 to 24 months, and sometimes as long as 48 months. This is an enormous problem for wind developers, for whom a period as short of two to 3 months is critical in completing a project so as to qualify for the tax credit that I mentioned, which expires, by the way, December 31st of this year.

Number two, full-year studies of avian or bird impacts. Anytime we talk to somebody on the Hill, they say what about birds? Birds are essentially not a problem with windmills. There was one area in California where they were because it was a huge bird flyway. You still have to do the studies. While numerous investigations

have shown that wind turbines do not pose a significant threat to bird or avian populations, studies of impacts in other wildlife are required under the National Environmental Policy Act before any permits may be issued.

Often, the Fish and Wildlife Service requires two to 3 years of study of potential impacts on fringe-toed lizards, bighorn sheep or Mohave ground squirrels prior to completing an environmental impact statement. Even if a wind developer is successfully in persuading the Fish and Wildlife Service officials into conducting a 12-month study, the time required to complete the work is still a problem. Specifically, during a 12-month bird study in a western State, such as Oregon, Washington, Montana or Idaho, there is often little to no bird activity during a three to 4 month winter season.

Our simple suggestion is to allow the Fish and Wildlife Service officials the discretion to accept data collected in a three-season period—spring, summer and fall—and dispense with the need to conduct meaningless winter studies. Allowing this discretion to dispense with winter studies on a case-by-case basis could reduce the NEPA process by as much as four to 5 months. Obviously, the use of this discretion would not be appropriate in situations involving wintering birds, such as bald eagles.

Again, all we are asking for is a little common sense to avoid delays, crucial in deciding whether or not to go ahead with a new wind project. And in conclusion, let me just say that both the environmental impact statements and specific wildlife impact studies are crucial and important aspects of Federal law. We are not seeking an elimination of these laws or a gutting of these laws. Again, we are just seeking simple common sense and kind of a rule of reason applied. Doing so will allow environmentally responsible development of wind energy on Federal lands, while also allowing our country to meet its pressing energy needs with clean, nonpolluting sources, such as wind and geothermal and other renewables. At the same time, we are boosting high-tech jobs and helping the rural economy.

[The prepared statement of Mr. Steve follows:]

Statement of Jaime Steve, Legislative Director, American Wind Energy Association

Chairman Hansen and members of the Subcommittee, my name is Jaime Steve. I am Legislative Director for the American Wind Energy Association. Wind energy development companies that I represent include Enron Wind Corp., FPL Energy (a subsidiary of Florida Power and Light), AEP (American Electric Power) based in Cincinnati, Ohio, and Pacificorp operating in the northwest and parts of Utah.

Increased use of clean, domestic wind energy on both private and public lands is a bipartisan issue with broad support in Congress and from the Bush Administration. For example, a five-year extension of the existing wind energy production tax credit (PTC) is contained in H.R. 4, the wide-ranging energy policy bill passed by the House earlier this year. This provision was also contained in the Bush–Cheney energy plan. A free-standing five-year PTC bill by Reps. Mark Foley (R–FL), Bob Matsui (D–CA), Jerry Weller (R–IL) and Karen Thurman (D–FL) has attracted 150 sponsors. An identical free-standing Senate bill - by Sens. Chuck Grassley (R–IA) and Kent Conrad (D–ND)—has attracted 26 sponsors. While the tax credit - crucial to continued wind development - is likely to be extended this year, it may be extended for a period less than the full five years needed to provide business the stability and certainty required to make long-term investment decisions.

The wind tax credit, coupled with more than 80 percent reductions in wind power costs since the 1980's has enabled wind to compete almost head-to-head with conventional energy sources. By the end of this year Texas alone will see more than

800 megawatts of wind power come on line. This amount of electricity is enough to meet the annual electricity needs of about 200,000 homes. At the same time, hard-pressed Texas farmers and ranchers leasing small portions of their land for wind development will gain annual payments of about $3,000 per windmill, per year, for at least twenty years. In addition, these wind developments are contributing to the tax base of local governments. The simple point is that wind energy is real and it is spurring significant economic development in rural America. Today, I would like to specifically address two issues affecting the ability to develop wind energy on Federal lands.

1.) Significant Delays by the Bureau of Land Management (BLM) in Processing Environmental Impact Statements

While I am not here to beat up on the Bureau of Land Management (BLM), I must point out that in the last two years there has been a significant increase in the time required by BLM to process Environmental Impact Statements (EIS)—required under the National Environmental Policy Act (NEPA) - before a right-of-way permit can be issued for a new wind project. What used to take six to nine months, now routinely takes 18 to 24 months and sometimes as long as 48 months. This is an enormous problem for wind developers for whom a period as short as two or three months is critical in completing a project so as to qualify for the previously mentioned wind energy tax credit.

2) Full Year Studies of Avian Wildlife Impacts

While numerous investigations have shown that wind turbines do not pose a significant threat to bird, or avian, populations, studies of impacts on birds and other wildlife are required under NEPA before any permits may be issued.

Often the U.S. Fish and Wildlife Service (FWS) requires two or three years of study on potential impacts to fringe toed lizards, big horn sheep, or the Mojave ground squirrel prior to completing an Environmental Impact Statement. Even if a wind developer is successful in persuading regional FWS officials into conducting a twelve-month study, the time required to complete the work is still a problem.

Specifically, during a twelve-month bird study in a western state such as Oregon, Washington or Montana there is often little to no bird activity during the three to four month winter season. Our simple suggestion is to allow FWS officials the discretion to accept data collected from the spring, summer and fall and dispense with the need to conduct meaningless winter studies. Allowing the discretion to dispense with winter studies - on a case-by-case basis—could reduce the NEPA process by as much as four to five months. Obviously, this use of discretion would not be appropriate in situations involving wintering birds such as bald eagles. Again, all we are asking for is a little common sense to avoid delays that are crucial in deciding whether to go ahead with a new wind project.

Conclusion

Both Environmental Impact Statements and specific wildlife impact studies are crucial and important aspects of the National Environmental Policy Act and other Federal laws designed to protect America's majestic and often threatened wildlife. We are not asking that these environmental protections be eliminated or gutted. What we seek is simply the application of a rule of reason, or a dose of common sense, when trying to meet the spirit of these laws. Doing so will allow environmentally responsible development of wind energy on Federal lands while allowing our country to meet its pressing energy needs with a clean, non-polluting, domestically produced resource that creates new high-tech jobs and boosts rural economic development. Thank you.

Mrs. CUBIN. Thank you, Mr. Steve.

The Chair now recognizes Dr. Butler.

STATEMENT OF BARRY LYNN BUTLER, Ph.D., VICE PRESIDENT AND MANAGER, ENERGY PRODUCTS DIVISION, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC), WASHINGTON, D.C., TESTIFYING ON BEHALF OF SOLAR ENERGY INDUSTRIES ASSOCIATION

Mr. BUTLER. Thank you, Mr. Chairman. It is a pleasure to be here representing the Solar Energy Industry Association. I know that you have read the testimony I present, so I would like to set

a them for it, and that is beyond price we need to talk about value, and beyond region, the things that are good for the Southwest, which reduce the energy demand there, make energy more available to other places. So, energy is sort of fungible.

The key in value is solar power is domestically produced and it is controlled by us. It is affordable, reliable and stable power. I live in California, and I have paid 18 to 25 cents a kilowatt-hour, so five cents does not matter as much to me as 18 does. So I have photovoltaics on my roof. I have a solar-heated hob tub. I have got solar power for my hot water, and I have got two Toyota Priuses, so I get 48 miles-per-gallon average fuel economy in my family.

That is value, and I think we need to focus on that. I represent 500 companies and I am actually a practitioner. I am out there making and selling these things. We employ about 20,000 people in this industry today. That includes the photovoltaics, concentrating solar power, which is what this stuff is, and the plants out in California, parabolic dish concentrators, power towers and zero net energy buildings. I mean, you can have megawatts and you can have negawatts, so conservation is a critical issue, and our industry covers all of those things.

The value proposition that I described is covered by what I call the five E's of solar: energy, which is just the production of energy; the second is economy and employment, and if you look at my charts, you will see that our industry is like the automobile industry. We take glass, steel, plastics, the same kind of things that we do in Detroit now, and we make that stuff and we put it out there and generate electricity with it. That creates high value-added jobs, $25,000 to $40,000 a year jobs. Those people pay taxes and they use that energy. They produce it in the United States and consume it here.

We can export the technology to the rest of the world, to make it a safer place. You already know it is environmentally friendly, but the fifth E of solar is it empowers us for control over our own energy future, and I think my companies stand ready to be producing 1,000 megawatts a year over the next 5 years and more after that. That does not sound like much, but that is a nuclear power plant a year, and that would represent almost 40,000 jobs in our industry, and we can accelerate that if you will help us, you know, get it on to Federal land.

A 10-by-10 mile plot of land, you will notice in one of my figures, produces 2,000 megawatts, which is the same as the Boulder Dam. So it is not a land-use intensive activity, and it is important for the Nation because these jobs are—what reminds me of this is the jobs are ones that we as a Nation have to make our decision about whether we pay our own citizens to make energy for us, by building solar collectors, deploying and maintaining them—it is the same with wind, same with geothermal; there is no difference there—or whether we pay then for oil and gas from other places around the world.

So, in our business, we use American materials, American technology, American factories that already exist. We are taking automobile workers and making solar collectors. We use American transportation to move the stuff around, Americans to install it, Americans to operate it, and we are making energy for Americans.

The price is higher or the cost of an electron you buy is higher, but the value to society—that high cost that you pay went to develop the technology for us.

So we are basically employing our people to make electrons for us, so that increase in cost we pay funds our own jobs. So, in summary, we have prepared, or I have prepared, a list of things we would like to see, the tax credits and the other things. I will not go into those in detail, because you have been able to read them here.

Thank you very much.

[The prepared statement of Mr. Butler follows:]

Statement of Barry L. Butler, Ph.D., Chairman, Concentrating Solar Power Division, Solar Energy Industry Association, and Vice President and Manager, Solar Energy Products Division, Science Applications International Corporation

Summary

Solar power is a domestically produced and controlled, affordable, reliable, and stable electric power resource. Solar power can be generated in large or small amounts, and can be generated in close proximity to where it is needed. This reduces the need for additional transmission line capacity. Its reliability makes it the energy source of choice for numerous remote applications, including on cell phone towers and along fuel pipelines.

For the purpose of this testimony, I am representing all of SEIA's member companies and its affiliated state and regional chapters more than 500 companies nationwide. The technologies within the term "solar" as I use it are photovoltaics, concentrating photovoltaics, parabolic troughs, power towers, parabolic dishes and zero net energy buildings.

One thousand megawatts of solar power systems are the energy equivalent of 1.2 million barrels of oil per year or a well producing 3,287 barrels per day. To give one example of the large-scale potential for solar, just 10.8 square miles of solar systems on public, private or Indian lands would produce 2,000 megawatts of power.

The Federal government is the largest consumer of electricity, and the largest landowner. A program that would drive even a small amount of solar energy generation on Federal lands and/or for Federal buildings would provide a dramatic boost in production, which in turn would accelerate the reductions in cost and improvements in efficiency that we have consistently seen in solar products over the last 25 years.

Growth in the U.S. solar industry produces numerous benefits, including a cleaner environment, new quality jobs, more energy to help our economy grow, and increased energy independence, which I will touch on further in a moment. On the other hand, without a healthy domestic market, U.S.-based manufacturing will ultimately yield to competitors in Europe and Asia, where governments are actively promoting solar energy deployment. The PV industry worldwide is growing at 25 percent per year today.

The good news is that U.S. Department of Energy solar research programs have helped bring us dramatic advances in solar technology and performance. (And I am not just saying that as an alumnus of our wonderful National Labs.) As Congress finalizes funding levels for fiscal year 2002, and begins to plan for future years, please keep in mind this record of success.

In addition to deploying solar on Federal lands and in Federal buildings, Congress can take other steps to accelerate solar deployment and reap its benefits. Among these are:

- *Net metering/interconnection standards.* Plugging in your solar power sources should be as easy, and as safe, as plugging in your phone.
- *Tax incentives.* Extension of the Production Tax Credit (PTC) to solar energy enjoys bipartisan support in both houses of Congress, and would help fuel powerful growth for the industry. In addition, a Federal 15 percent Residential Solar Energy Tax Credit has already passed the House. Please urge your Senate colleagues to join you in making that provision law this year. Increasing the Investment Tax Credit from 10 percent to 20 percent would also be a useful, and effective, way to encourage businesses to deploy more clean solar energy.
- *Appropriations.* For fiscal year 2002, the Administration originally proposed dramatic cuts in solar and renewable energy research and development programs

at DOE. But the White House now supports additional funding. The House–Senate Conference Committee should agree on aggressive funding for solar R&D programs in fiscal year 2002 and beyond. My industry, the CSP industry, stands poised to leverage those DOE research, development, and deployment dollars to get new power generation up and running quickly in the southwestern United States, including California.

- Solar development bank. A solar development bank, or revolving loan guarantee, would help the solar industry surmount the high up-front costs that have inhibited faster industry growth. Low interest rate financing would also address this problem.
- *A national solar portfolio standard.* This would help the nation the way similar state efforts have helped those states that have adopted them.
- *Long-term power purchase agreements.* Twenty-year power purchase agreements would help the industry secure the private investment dollars and bank loans needed to grow more quickly. Again, the up-front costs are more substantial for solar than for some other energy sources.
- *Solar schools/reservations/agriculture.* An increased use of solar power in our nation's schools, which would also help our ailing K–12 science programs, and on Indian reservations (remote locations where power lines are prohibitively expensive), would also prove beneficial.

Finally, as our country responds to the tragic events of Tuesday, September 11, we see how our freedom of action is restrained by our need for oil in the Middle East. Certainly, this should remind us that energy independence is a worthy goal for our nation, one that will not just help our economy but improve our national security. Solar power should play an important role in any effort to reduce our dependence on foreign energy sources.

And before I leave this point, I would like to say as a personal aside that I am just one of the millions of Americans who is proud of how the Congress and the Administration have responded in a united fashion to the terrorist attacks on our nation. Thank you very much. I would be happy to answer your questions.

The benefits of solar development are explained as the five E's of solar on national public lands. They are Energy, Economy (employment), Export, Environment, and Empowerment.

ENERGY is the first E. Solar energy can be viewed as an undepletable oil well. One thousand megawatts of solar power systems are the energy equivalent of 1.2 million barrels of oil per year or a well producing 3,287 barrels per day. The land area needed to produce the same amount of electricity as Hoover Dam is shown in figure 1, where 10.8 square miles of solar systems can produce 2,000 megawatts of power on public, or Indian lands. However, a large number of 11-square-mile areas can be developed on public lands and provide a significant fraction of the country's energy requirements, perhaps 20 percent or more over the next 10 years.

In California, the most aggressive state utilizing and striving for clean power, the solar percentage is less than 1 percent. This can be seen in figure 2, which shows where Californians get their electricity. California's electricity generation sources favor solar more heavily than the nation as a whole.

ECONOMY is the second E. Deploying 5,000 megawatts by the year 2006 could be accomplished using national public lands, and would be accomplished by using all of the solar technologies at our disposal, which are shown in figure 3. The first is photovoltaics, which turns sunlight into direct current electricity, and can be inverted to AC power for the grid. These systems appear on the left-hand side of the figure for grid tied applications and on the right-hand side as part of solar buildings. The second option is dish/engines, which convert sunlight into heat and then electricity and concentrating photovoltaic systems, which use less solar cell area and a reflecting or refracting solar concentrator. The third option is power towers, which concentrate the solar radiation on a tower-mounted receiver, where the high temperatures can be used to generate steam and drive a conventional turbine producing electricity. The fourth option is parabolic trough technology, which is currently the most utilized of all the solar technologies and produces 354 megawatts in the California desert. The parabolic trough systems have been operating continuously and cost-effectively in the California desert for the last ten years. The fifth option is zero net energy solar buildings. In this case, office buildings and residences can be equipped with photovoltaics, solar domestic hot water, solar industrial heat systems, and/or natural daylighting systems, which reduce their demand for electricity and move them toward energy independence.

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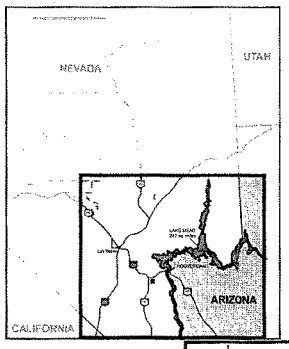


CONCENTRATING SOLAR POWER INDUSTRY

"Mirrors Without Smoke"

Colorado River Water and Concentrating Solar Power Lifelines of the Southwest

Solar energy is not a land-intensive resource. Solar thermal uses much less land than hydroelectric to produce the same amount of electricity and creates more sustainable jobs. Troughs and towers use about 17 square miles. Dish/engines use about 10.8 square miles vs. Lake Mead's 247 square miles.

The enlarged square shows the area that a solar system of 2,200 peak megawatts, generating the same amount of electricity as the Hoover Dam, would occupy (2,500 gigawatt-hours per square kilometer are assumed). The installed capacity of the Hoover Dam system is 2,074 peak mega-watts, and it generated 4,000 gigawatt-hours last year.

- 25 kW dish engine systems produce about 58,000 kWh/yr.
- 59,000 dish systems = 4,000 GWh/yr.
- At 10 dish systems per acre, 10.8 sq. miles are needed (3.3 miles x 3.3 miles) or 27 sq. kilometers are needed (5.2 km x 5.2 km)

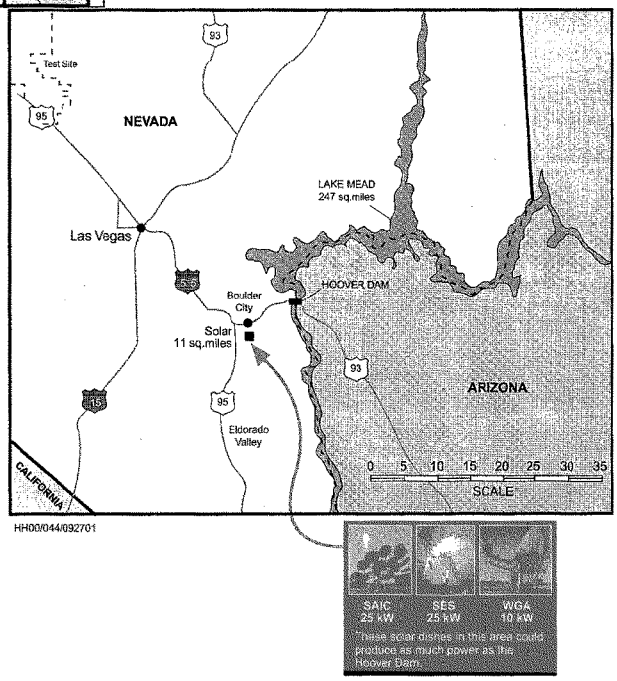


Figure 1. Hoover Dam

CALIFORNIA can have 5% clean solar electricity by 2006, a first step toward energy independence and stable prices. The rest of the nation could follow.

Power Electric Plant Totals*	# of Plants	Capacity (MW)	% of Supply	New Additions Year 2003	New Additions Year 2006
Hydroelectric	386	14,116.53	27%		
Geothermal	46	2,561.70	5%		
Oil/Gas	340	27,733.42	53%	15,324	31,709
Coal	15	549.50	1%		
Wind (Wind Park Areas)	104	1,814.68	3%	100	500
Biomass	38	689.97	1%	100	500
MSW (Municipal Solid Waste)	30	202.09	<1%		
Nuclear	2	4,310.00	8%		
Solar	14	412.63	<1%	250	5,000
GRAND TOTAL:	975	52,390.52			

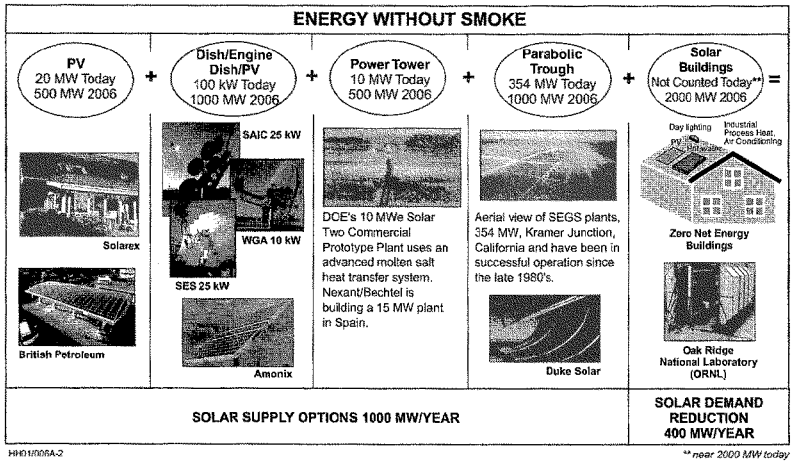
Higher demand for oil and gas tends to increase price.

HH01/006A-1

*California Energy Commission data. Plant totals are for operational plants of .1MW and above.

Source: California Energy Commission – Energy Facilities & Environmental Protection Division, Jan. 2001

Figure 2. California Can Have 5% Clean Solar Electricity by 2006



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** near 2000 MW today

Figure 3. Solar Fuel Price Escalation Resistant Options

Creating 5,000 megawatts of solar power in the Southwest by 2006 would provide 15,000 new jobs, create $1.5 billion in new revenue, and support a 1,000-megawatts-per-year production capacity. This is based on reducing system cost to $2.50 per watt resulting in electricity prices of $0.10 per kilowatt-hour. This analysis is shown in figure 4.

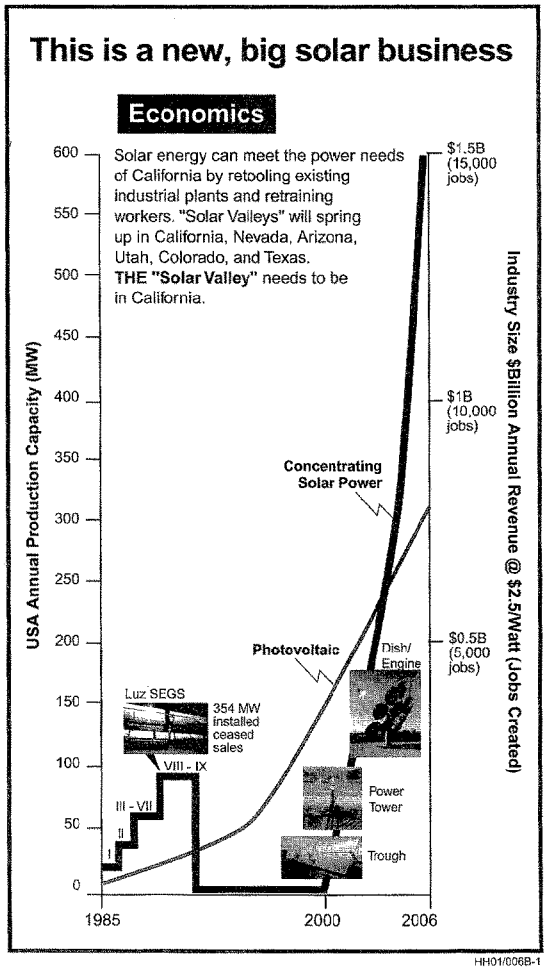


Figure 4. This Is New, Big Solar Business

A very important subset of the economy is employment. The high cost of solar is a result of the fact that it is a manufacturing-intensive business similar to the automobile industry as shown in figure 5. Drilling for oil and gas from reservoirs requires only 1.8 people per million dollars of energy sales, but it takes almost 9.9 people per million dollars of energy sales to make solar systems as shown in figure 6. We as a nation must decide whether to pay our own citizens to manufacture solar collectors or to send our money offshore to pay for foreign oil.

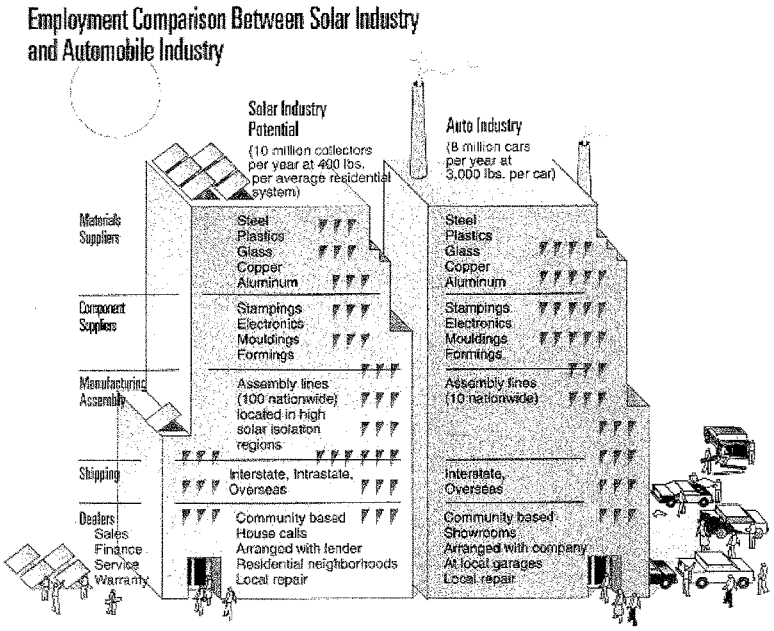


Figure 5. Comparison of Auto and Solar Industries

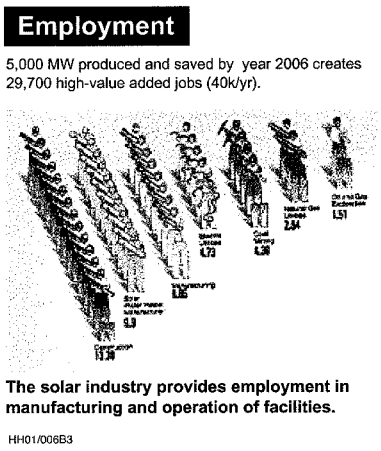


Figure 6. Employment

Manufacturing, installing, and operating solar electric generating systems costs more today than buying foreign and domestic fossil fuels and burning them in power plants. But, how long will this be the case? Solar collectors use American materials, American technology, American factories, American workers, American transportation, American installation, and American operation Americans making energy for America.

EXPORT is the third E. Americans manufacturing and selling solar energy technology to the rest of the world is a tremendous export market. At 2 percent growth of the 3 million megawatts, world electricity production will require 60,000

megawatts of new plants per year for the next 10 years. We can export solar electricity-generating technologies to countries all over the globe. The U.S. produces 800,000 or nearly one-third of the world's total. We can increase their electricity production without increasing global pollution. This increased standard of living based on electricity availability for the rest of the world does not place increased pressure on global fossil fuel reserves and will make the world a more stable and safe place for citizens of all nations.

This solar program is a partnership between the National Laboratories and the nations industries. The National Labs are working with industry on critical materials and systems that support our industry's next-generation technologies. They will help our solar industry maintain our international lead in technologies we have developed. International competitors intend to take the solar business away from U.S. companies.

ENVIRONMENT is the fourth E. Solar systems produce no air pollution during operation. Compared to other forms of electricity production, solar is relatively benign as can be seen in figure 7. The benefit of solar energy is that it is available on most of the national public lands, making it an ideal energy option in much of the lower 48 states and the Pacific Islands. The environmental consequences of obtaining raw materials from the earth and fabricating glass, metal, and plastic components for solar collectors are similar to the environmental consequences found in the automobile and semiconductor manufacturing industries. We learned how to manage these environmental consequences in those industries and would manage them similarly in the solar industry. Solar collectors can be easily recycled saving money and materials.

Environmentally clean energy

Pollutant Emission Factors for Electrical Generation (g/kWh): The Total Fuel Cycle*

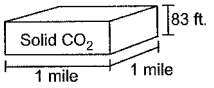
Energy Source	CO_2	NO_X	SO_X
Coal	322.8	1.8	3.400
Oil	258.5	0.88	1.700
Natural Gas	178.0	0.9	0.001
Nuclear	7.8	0.03	0.030
Photovoltaics	5.3	0.007	0.020
Biomass	0.0[1]	0.6	0.140
Geothermal	51.5	TR	TR
Wind	6.7	TR	TR
Solar Thermal	3.3	TR	TR
Hydropower	5.9	TR	TR

TR = trace

[1] with biomass fuel regrowth program

* Fossil fuel emission factors provided by the American Gas Association; nuclear and renewable energy sources from the Council for Renewable Energy Education.

3,000 MW plants would cover 18 sq. miles of California desert. 3,000 MW produce 6 x 10^9 kWh/yr. and eliminate 2.3 billion pounds of CO_2 annually compared to generating 3,000 MW with natural gas.



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Solar energy use reduces the emissions of pollutants from traditional fossil fuel plants.

Figure 7. Environmentally Clean Energy

EMPOWERMENT is the fifth E. The use of national public lands for solar electricity production could provide us with the national incentive to develop solar resources in this country. Here are a few suggestions as to how this Committee of the United States House of Representatives could take positive actions to encourage solar development on national public lands.

Since solar systems purchase "fuel" in the form of a capital cost up front, some additional Federal actions to help the solar industry move quickly are:

1) Freedom from Federal tax on financial institution income from loans issued for the purpose of constructing a) solar-only installations or b) the solar fraction of solar/fossil hybrids
2) Federal guarantee of loans made by financial institutions for the purpose of constructing a) solar-only installations or b) the solar fraction of solar/fossil hybrids
3) Permission for Federal facilities to enter into power purchase agreements for electricity from solar or solar/fossil hybrid plants for periods in excess of 10 years
4) Freedom for project developers or plant owners to utilize state or local incentives, or other existing Federal incentives, with any of the foregoing

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Mrs. CUBIN. Thank you, Dr. Butler. One thing that sticks out to me from all of your testimony is that you do not have access to public lands, or if there is access there are so many impediments and expenses that it does not make it realistic. Well, we have been hearing that for years, but people on the other side of the aisle just do not believe that, or some of them just do not believe it. We have been showing studies where they say that the BLM says that 95 percent of the public—or BLM lands are available for oil and gas exploration. Therefore, I assume if they are available for oil and gas exploration, they must be available for all your industries, as well.

Well, it simply is not true, and I think that is a message that we have to get out there, that I do not know what they mean by available, but it does not seem to be available in a reasonable, affordable, practical way. I am going to start my questioning with Mr. Hulen. You talked about bureaucratic delays that the geothermal industry experiences, and one of the things you called for—excuse me, that was Mr. Weisgall. I will get back to you, Mr. Hulen. One of the things you talked about was eliminating duplication.

That was not clear to me whether you meant elimination of duplication between State and Federal requirements, or whether you meant elimination of duplication between Federal agencies on Federal land.

Mr. WEISGALL. It is both. You frequently will have two Federal agencies looking at the same problem, you would have two State agencies—this is really three—and you can have a Federal and a State agency looking at the issue. The real point here is I really want to echo what you heard from Mr. Steve. It is the need for a rule of reason. Look, we are all in the environmental business, so there is no one in my business, in the geothermal business, that is looking to end-run environmental laws. They are there, they make sense, but they have to be applied reasonably, and that is really what I am getting at.

The CalPine folks who are going forward faced it. We faced it in our EIS, of having—I can't begin to tell you how many different agencies, both Federal and State, looking at issues, the number of meetings and the overlap and duplication. There is a lot that can be done. Frankly, it is probably more of an administrative-executive branch issue. Perhaps this renewable summit that you heard about will address some of those specifics, but it is endemic.

Again, when I go to the Chairman of my board with a development project, and one is going to take 4 years of permitting and applications, not counting the drilling, not counting everything else, versus moving more quickly on private land, where, in California, you have still got the California SEQUA process. It is as tough as the Federal process, but it is a little bit better organized. It is real tough to go the Federal route. That is my point.

Mrs. CUBIN. As you are aware, we worked more with oil and gas and coal, and all of their problems accessing Federal lands. But I assumed that yours have to be comparable, and because the energy you produce is such a smaller portion of the overall consumption, that is one reason why. But obviously the time has come that we need to get moving on that.

You are talking about environmental impact statements that have to be prepared that take 2 years. Would those be exactly the same kind of environmental impact statements, Mr. Hulen, that would be required if it were an oil or gas well? Are the same things looked at? In other words, compare the environmental risks between exploring for geothermal and exploring for oil and gas, for example.

Mr. HULEN. Geothermal energy is, in fact, one of our most environmentally-benign energy sources.

Mrs. CUBIN. The energy is. I am talking about the drilling for it. I am talking about obtaining it, the process that requires you to get a 2-year environmental impact statement before you can move forward.

Mr. HULEN. By contrast with conventional petroleum drilling, drilling for geothermal energy resources is typically a very arduous, very difficult undertaking, because you are dealing with hard, abrasive reservoir rocks. They are hot. They are fractured. In fact, these are the very elements which are required to make a successful geothermal resource. So the cost of drilling a geothermal well are significantly greater than for drilling a typical well for oil and gas.

Mrs. CUBIN. What are the environmental differences in drilling, or at least the differences that are considered to be different by agencies of the government?

Mr. HULEN. Between petroleum and geothermal?

Mrs. CUBIN. Right.

Mr. HULEN. I would have to defer an answer to that question for the written record, Madam Chairman, or perhaps to my colleagues on the left.

Mrs. CUBIN. We, in H.R. 4, which is the SAFE Act, the President's energy bill, we provided, going back to the duplication problem, we provided that the Secretary of Agriculture—and I hope I have this right. If not, I will correct it for the record—that the Secretary of Agriculture have to explain why a veto over a decision made by the Interior Department, the BLM or some other department, would be made. We found that there are laws that are contradictory in and of themselves, as far as what are required, and certainly rules and regulations that are contradictory from one agency to another, as to what is required before a permit can be granted.

So, I guess, Mr. Steve, are you aware of any—you all said that it is the bureaucratic hang-ups that are the problem. Are you aware of differences in laws or rules and regulations that we might be able to address? I know you said that you thought it was mostly an administrative problem. But are there any laws, rules, whatever, that the Congress can deal with?

Mr. STEVE. I am not aware of any specific conflicts of law, but as we have heard elsewhere from the other folks in industry, it really comes down to the kind of bureaucratic problem of when you get in, you have to deal with BLM, Fish and Wildlife Service, and then the State agencies, as well. So everybody gets a hand in it. Now, everybody has an interest, that is accurate, and those interests should be carried out. We are just looking to do so in a more expeditious fashion.

As I say, I do not want to harp on this too much, but access to this tax credit, if Congress acts to do a 1-year extension of the existing wind tax credit, which also benefits a couple of other renewables, as well, but if there is only a 1-year extension and then you try to jump into a project and get your financing, and you find out your environmental impact statement is going to take you 2 years, maybe more—

Mrs. CUBIN. And how much is it going to cost?

Mr. STEVE. Yes, actually, our companies are less concerned about the duration. They want to do it accurately, they want to do it right, but they want to do it quickly, as well, so that they can get access to that credit.

Mrs. CUBIN. Deputy Secretary Griles talked about some added personnel that we were able to obtain for the BLM to expedite processing of coal-bed methane permits, and it seems like BLM, because they manage the land, is always being torn from—well, if it is coal-bed methane, well, this area wants them to hurry up and get their APDs done, and so on.

We found when we were trying to expedite all of those—I think there are like 3,500 APDs pending in just the Paddle River Basin alone in Wyoming, and we found that finding people that are experts to even do them is difficult. Tell me the situation for your industries. Are the experts available if the BLM was able to hire them, if they had more money to hire more people to expedite the EIS and all of the things that you have to do?

Mr. STEVE. I have to be frank with you. I do not know the answer to that question. I am hoping that there are enough college graduates out there that would jump at those jobs. That is my hope, but I do not know what the job pool is.

Mr. WEISGALL. Geothermal, that has not been a problem. There are more consultants than you can shake a stick at in the geothermal field. They are good, people who have been in industry who have left. That is not the problem. By the way, in the project I described to you, BLM, I think, did a very good job. But you had Fish and Wildlife, you had Forest Service and you had these other agencies, and frankly the interests of the U.S. Forest Service and interests of BLM frequently clash, and that has been more of the problem.

So, at least speaking for the geothermal industry, I have not seen that kind of shortage, and the delays have not been due to the lack

of expertise. They have been a little bit more political. We were dealing with a possible roadless release policy that might have come out, which then led to a moratorium, which has led to killing a project. That policy never came out. We were not going to wait around for three more years to find out what happened. We deploy our capital elsewhere.

Mr. STEVE. Can I amplify with an anecdote?

Mrs. CUBIN. Sure.

Mr. STEVE. One of the companies that I represent is based out in California, Southern California, Palm Springs area, and this one fellow, in order to gain access to his own land, he had to go 20 feet on the BLM land in order to just get around some trees, essentially, and that triggered an environmental impact statement.

Mrs. CUBIN. Yes.

Mr. STEVE. He is not too happy about it.

Mrs. CUBIN. It is just incredible, the absence of common sense in some of these situations, but I think we all want to protect the environment. I know we all want to protect the environment. Our families live in it, but it just seems that there has to be a better way. We need to cut back on multiple agency jurisdiction and rules and regulations that are piled one upon the other upon the other upon the other, and that end up being contradictory and actually not very useful at all.

Dr. Butler, for grid-connected electricity, solar energy is generally not competitive with other renewables, such as geothermal or wind. Do you foresee any developments which could significantly improved the competitiveness of grid-connected solar?

Mr. BUTLER. I do. If you look at the Department of Energy program with the solar companies, photovoltaic and concentrating solar power, and indeed even for solar buildings, the price of the electricity, 12 cents a kilowatt-hour, is still good for grid-tied electricity, and concentrating solar power is expected to get down to six, not quite as low as wind, but certainly in the six-cent-a-kilowatt-hour range, and it also will be deployable—you noticed it covers a large geographical area. So it can be deployed close to where it is utilized, so the transmission cost, added transmission costs, could help make it cost-effective.

So I see that both photovoltaics and concentrating solar power can get into the market at like six to eight cents a kilowatt-hour, once they are fully developed, and that is reasonably good for grid-tied. But if you then go to the other side of the meter, the customer side of the meter, where you start siting them on the locations like the buildings, where you have zero net energy buildings, then the value with net metering, as you pointed out earlier, may be much higher than that.

So I think that we do see them interacting in a very large way with both the grid and off-grid applications.

Mrs. CUBIN. I have one last question. From the experience of your members, do lease terms and rentals and fees for BLM land hinder the development of solar?

Mr. BUTLER. The land cost, because it does require a lot of land, has been an issue, and it would be nice to have lower-cost land. I think the larger barrier, like with all of our technologies, has been that the first cost is all your energy cost. So you do not get to write

off the cost of the fuel you buy. You have to pay all your capital up front, which makes them very expensive. So avoiding property taxes, getting investment tax credits and other things which help reduce the cost of the initial equipment are probably more of a driver than just the use of the land, but we would certainly like lower-cost land and access.

Mrs. CUBIN. Well, I want to thank all of the panel for their testimony and their answers to the questions. We will keep the record open, and with your permission, we will have written questions that we would like a response to.

Thank you very much for being here, and I regret that there is so much going on today that there were not more Committee members here. But truly your testimony is very valuable, it will be on the record, and I will not be forgetting it when we are talking about how available BLM lands are. Thank you very much. The full Committee hearing is adjourned.

[Whereupon, at 1:14 p.m., the Committee was adjourned.]

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