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Report to Congressional Requesters

June 2004

GEOTHERMAL ENERGY

Information on the Navy's Geothermal Program

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GAO-04-513

June 2004

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Highlights

Highlights of GAO-04-513, a report to congressional requesters

GEOTHERMAL ENERGY

Information on the Navy's Geothermal Program

Why GAO Did This Study

Geothermal energy is heat from the earth that can be used to generate electricity. The Department of the Interior's Bureau of Land Management (BLM) has the primary responsibility for leasing public lands to private companies for geothermal development. In addition, the Secretary of each military department has the authority to develop geothermal resources on military lands and to keep the proceeds from the sale of electricity generated from those resources for use by the Department of Defense. The Navy's Geothermal Program Office, located at the China Lake Naval Air Weapons Station in California, manages and develops geothermal resources for the military. Currently, two geothermal power plants at China Lake are the only ones on military lands. A private company, which built, owns, and operates the power plants at China Lake, sells the electricity to a utility company and pays the Navy royalties on these sales as well as other types of compensation.

GAO was asked to provide information on (1) the Navy's annual revenues from the geothermal facility at China Lake, (2) how the Navy uses the revenues it collects from the geothermal facility, (3) the budget oversight the Navy provides programs funded from geothermal revenues, and (4) how the Navy's geothermal program differs from BLM's program.

www.gao.gov/cgi-bin/getrpt?GAO-04-513.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Jim Wells at (202) 512-3841 or wellsj@gao.gov.

What GAO Found

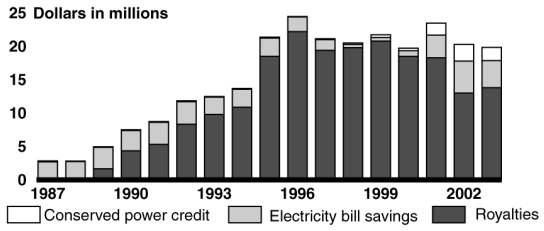
The Navy received three types of payments from the geothermal power plant operator at China Lake that totaled, on average, $14.7 million annually between 1987 and 2003. During these years, the average annual royalty payment on the sale of electricity was about $11.5 million, payments toward the base's electricity bill were about $2.7 million annually, and bonus payments to the base for using less electricity than it had projected averaged about $500,000 annually.

The Navy spent about two-thirds of its geothermal revenues on a variety of energy conservation projects, including solar energy systems and updated climate control systems, as well as other energy conservation programs. The Navy spent the other one-third of its geothermal revenues on its Geothermal Program Office, which oversees the activities of the power plant operator and assesses other military sites for geothermal development.

The Navy's Shore Energy Policy Board, which includes representatives of the Secretary of the Navy and the Chief of Naval Operations, oversees the budget for most of the programs funded from the geothermal revenues. Typically, at its annual meeting, the board reviews the draft budget for energy conservation programs, determines whether the funding levels are appropriate, and agrees on final allocations. The China Lake base's Renewable Energy Program office oversees the budget for the remaining geothermal revenues.

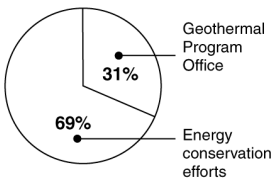
The Navy's geothermal program differs from BLM's program in significant ways. The Navy makes case-by-case decisions regarding geothermal development, invests in the initial exploration to identify geothermal resources, provides close oversight over geothermal production, and keeps all revenues for use by the military. In contrast, BLM uses a standard approach to geothermal development, does not invest in exploration, and does not provide the same level of oversight over resources in production. Also, 50 percent of BLM's geothermal revenues are shared with the state of origin, with the remainder paid to the Department of the Treasury. The Department of Defense provided technical comments on a draft of the report, which GAO addressed as appropriate. BLM said that the report implies that its program is not properly managed. GAO's report is focused on the Navy's program and does not evaluate BLM's program.

Total Navy geothermal revenues by source through December 31, 2003



Source: GAO analysis of Navy data.

Total Navy expenditures through December 31, 2003



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Abbreviations

BLM	Bureau of Land Management
KGRA	Known Geothermal Resource Area

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United States General Accounting Office
Washington, D.C. 20548

June 4, 2004

The Honorable Richard Pombo
Chairman
Committee on Resources
House of Representatives

The Honorable Barbara Cubin
Chairman, Subcommittee on Energy
and Mineral Resources
Committee on Resources
House of Representatives

The Honorable Jim Gibbons
House of Representatives

Geothermal energy is heat from the earth that is captured by drilling wells, brought to the surface as hot water or steam, and used to drive turbines to generate electricity, among other things. It is a renewable resource that produces very few emissions compared with energy generated from coal, natural gas, or oil. Geothermal electricity production is currently concentrated in California and Nevada, although production potential exists in several other states. The Geothermal Steam Act of 1970 gives the Secretary of the Interior the authority to lease public lands and certain other federal lands, including national forest lands, for geothermal development. The Secretary has delegated this responsibility to the Bureau of Land Management (BLM).

Beginning in 1978, Congress passed laws that also gave the Secretary of each military department the authority to develop geothermal resources on lands under his jurisdiction and to keep the proceeds from the sale of electricity generated from those resources for use by the Department of Defense. The Navy's Geothermal Program Office is responsible for managing and developing geothermal resources on all military lands for the Department of Defense. Currently, this office has contracted with a private company to produce electricity from geothermal energy at one military installation—the China Lake Naval Air Weapons Station in California. The Navy is also currently considering contractors to develop a geothermal power plant at the Fallon Naval Air Station in Nevada. The private company, which built, owns, and operates the two power plants at China Lake, sells the electricity to a utility company and pays the Navy royalties on these sales as well as other types of compensation. The Navy first

received royalties in 1988 but began receiving other forms of revenue from the power plant operator in 1987.

As agreed with your offices, this report provides information on (1) the Navy's annual revenues from the geothermal facility at China Lake, (2) how the Navy uses the revenues it collects from the geothermal facility, (3) the budget oversight the Navy provides programs funded from geothermal revenues, and (4) how the Navy's geothermal program differs from BLM's program. To address these issues, we obtained and assessed the reliability of the Navy's geothermal revenue and expenditure data and determined that the data were sufficiently reliable for the purposes of this report. We did not evaluate the quality of the Navy's budget oversight because doing so was outside the scope of this review. In addition, while the report describes the differences between the Navy's and BLM's geothermal programs, it does not compare their respective advantages and disadvantages or their costs and benefits. Finally, we did not conduct an assessment of the Navy's internal controls over its geothermal program, such as its procedures for planning and controlling program activities or measuring and reporting program performance, because doing so was outside the scope of this review. We conducted our review from August 2003 through May 2004 in accordance with generally accepted government auditing standards. Complete information on the scope and methodology of our review can be found in appendix I.

Results in Brief

The Navy received three different types of revenue from the geothermal facility at China Lake that totaled, on average, about $14.7 million annually from 1987 through 2003. The three types of geothermal revenues are: (1) royalty payments on the sale of electricity, (2) payments toward the base's electricity bill, and (3) payment for conserving electricity use at the base. The average annual royalty payment the Navy received between 1987 and 2003 was about $11.5 million—a payment that ranged from a low of less than $100,000 to a high of more than $20 million. The company operating the power plants also directly paid about $2.7 million a year toward the China Lake base's electricity bill under the terms of its contract with the Navy. Finally, the company paid the base, on average, about $500,000 annually under a contract provision that rewards the base when it uses less electricity than it was projected to use. Between 1987 and 2003, the Navy received a total of about $249 million in geothermal revenues, or about 11 percent of the total electricity revenues of $2.3 billion received by the power plant operator. In addition to annual revenues, the contract calls for

the Navy to receive a $25 million payment from the power plant operator at the end of the contract in 2009.

Between October 1, 1989, when the Navy first began spending its geothermal revenue, and December 31, 2003, it used the majority of its revenues—about two-thirds—to fund energy conservation activities, such as funding staff to identify and develop potential energy savings projects and providing the initial funding for base commanders to begin implementing energy savings ideas. The Navy estimates its investments in energy efficiency have resulted in significant energy cost savings, and in 2003 the Navy's Energy Program received the Presidential Award for Leadership in Federal Energy Management. The remaining one-third of the Navy's geothermal expenditures went to its Geothermal Program Office, which manages the geothermal resource at China Lake and develops new geothermal resources on other military facilities. The Navy's resource management efforts included monitoring the activities of the private company that operates the power plants as well as monitoring other key aspects of the geothermal resource to help prolong its productive life. Most of the Navy's resource development efforts have focused on identifying and characterizing the quality of geothermal resources at other military installations, including the Fallon Naval Air Station in Nevada.

An internal Navy board provides the budget oversight for most of the programs funded from geothermal revenue, and an office at the China Lake base oversees the budget for the remaining revenue. The Navy's Shore Energy Policy Board, which includes representatives of the Secretary of the Navy and the Chief of Naval Operations, oversees the budgeting of the Navy's about $11.5 million in average annual geothermal royalties. These funds may be used to pay for energy costs and energy conservation projects without further approval by external entities, such as the Office of Management and Budget or Congress. Given this authority, the Navy's Energy Program manager, who reports to the Shore Energy Policy Board, prepares a budget proposal by synthesizing the funding requests from the Geothermal Program Office and the managers of the energy conservation programs funded by the geothermal revenue. The budget process typically culminates in an annual board meeting at which the budget is reviewed and approved. The China Lake base's Renewable Energy Program office oversees the budget for the revenues it received because the base used less electricity than it was projected to use. The office determines which projects to fund based on an assessment of multiple criteria, including the project's cost, available funds, and impact on energy savings goals, among others.

The Navy uses a fundamentally different approach to geothermal development and management than BLM. The Navy makes case-by-case decisions regarding geothermal development. As a result, the terms of its future development contracts could differ from those of the current contract at China Lake. BLM, on the other hand, in accordance with its regulations, uses a standard approach to geothermal development, with lease provisions that are largely consistent for all leases. In addition, at the China Lake and Fallon bases, the Navy has conducted the initial work to identify developable geothermal resources. In contrast, BLM does not invest in exploratory work to identify developable geothermal resources on the lands it administers. In addition, the Navy provides closer and more frequent oversight of geothermal resources in production than BLM. The Navy's approach also involves keeping all geothermal revenues for use by the military, whereas 50 percent of the royalties paid on BLM's leases are returned to the state of origin, with the remainder paid to the Department of the Treasury. Beyond the differences in overall approach to geothermal development, the agencies have different contract and lease terms. In particular, the Navy's contract at China Lake includes royalty rates that are, on average, higher than BLM's royalty rate. According to the Navy, it was able to negotiate a higher royalty rate, in part, due to its initial investment in identifying the resource, which reduced the risk and cost for the developer. In addition, extensions to the power plant operator's 30-year contract at China Lake are at the Navy's discretion, whereas BLM's original 10-year leases will be routinely renewed for up to an additional 40 years as long as commercial geothermal production continues or other conditions are met.

We provided the Department of Defense and the Department of the Interior's Bureau of Land Management (BLM) a draft of our report for review and comment. The Department of Defense provided technical comments, which we addressed as appropriate. In written comments, BLM said that our report implies its geothermal program is not properly managed or overseen. Our report is focused on the Navy's program and does not evaluate BLM's program.

Background

The process of geothermal energy development begins with identifying a likely source of geothermal energy through exploration. Identifying geothermal energy sources that can be competitive with other fuels involves obtaining and analyzing a complex variety of geologic (characteristics of rocks), geophysical (variation in magnetic and gravity fields), and geochemical (chemical characteristics of water) data. Although

a wide variety of data can be used to identify an area with a high likelihood of containing a geothermal resource, positively identifying and defining the nature of the resource requires drilling a well though the earth's surface. According to the Department of Energy, exploration can account for as much as 60 percent of the cost of a geothermal power project, and most of the cost of exploration is associated with drilling wells. After wells have been drilled, they can be used to pump hot water or steam to the surface and for returning fluids to the reservoir after they have been used to generate electricity.

According to a BLM official, geothermal energy from both public and private land provides about 2,200 megawatts of electric power nationwide. In 2003, geothermal electricity represented less than 1 percent of the nation's total electricity output. According to data compiled by the Geothermal Energy Association, about 70 percent of the existing geothermal power plants came on line in the 1980s. Geothermal power plant construction has declined significantly in the 1990s because of several factors, including loss of government incentives and the introduction of low-cost electricity generated from natural gas.

BLM reviews and approves leases and permits to explore, develop, and produce geothermal energy on public land and certain other federal lands, including national forest lands. The agency is also responsible for ensuring that leaseholders' geothermal operations comply with BLM's regulations. In 2003, BLM's geothermal program had six full-time and seven part-time staff, most of who were located in BLM field offices in the western United States, including California, Nevada, Oregon, Utah, and Idaho, among others. The program's budget was $1.35 million in fiscal year 2003, which included a targeted amount of $600,000 for one year only to be spent on processing a backlog of lease applications in Nevada. The program's fiscal year 2004 budget is $1.24 million, which does not include any funds targeted for special projects. There are 34 power plants that use geothermal energy from BLM leases in three states (California, Nevada, and Utah). These power plants have a total electricity production capacity of about 1,200 megawatts, according to BLM.

Although BLM has the primary responsibility for leasing public and certain other federal lands for geothermal development, on several occasions, Congress has passed laws that have given the Department of Defense the authority to develop geothermal resources on lands under its jurisdiction. In 1978, Public Law 95-356 authorized the Secretary of each military department to develop, for the use or benefit of the Department of Defense,

any geothermal energy source within lands under the department's jurisdiction, other than public lands administered by the Secretary of the Interior. The law specified that the military could contract for a period not to exceed 30 years "for the provision and operation of energy production facilities." In 1982, Public Law 97-214 expanded the military's ability to develop and use geothermal resources by extending its authority to public lands set aside for military purposes. In 1984, Public Law 98-407 authorized the Secretary of a military department to sell electricity produced from alternative energy projects, which include geothermal projects, and to credit the proceeds to the account it uses to fund its supply of electricity.

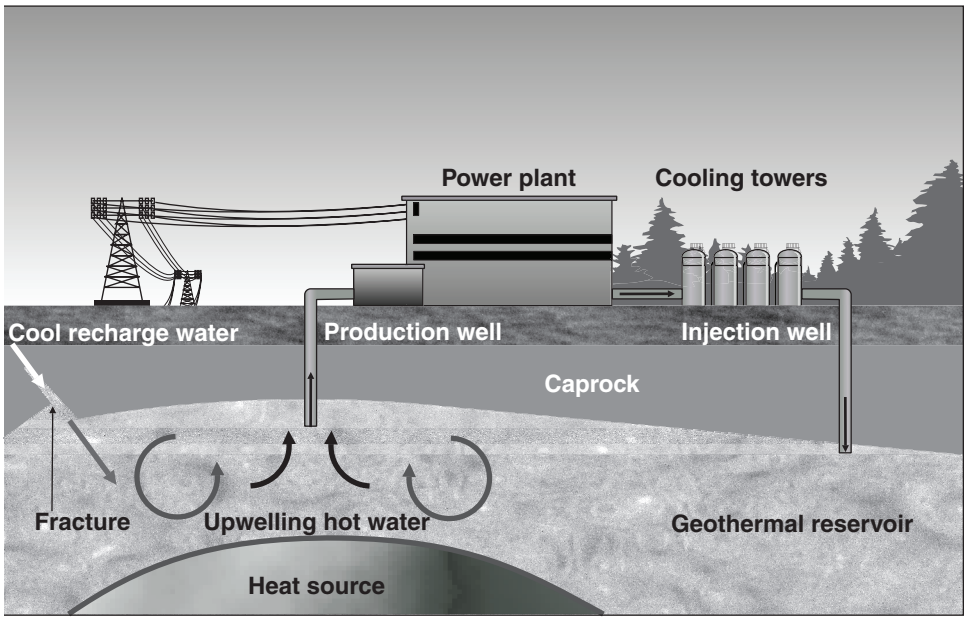
The Navy's geothermal program consists of overseeing the operations of the two power plants at China Lake, known as Navy I and Navy II, and developing geothermal resources at other military facilities, most prominently the Fallon Naval Air Station in Nevada. See figure 1 for the location of the China Lake base in California and the Fallon base in Nevada.

Figure 1: Location of the China Lake Naval Air Weapons Station and the Fallon Naval Air Station

Source: Navy.

In 2003, the Navy's Geothermal Program Office had a budget of about $6.2 million and a staff of 12, which included a program manager, a geologist, 2 geophysicists, other technical professional staff, a business manager, and clerical staff. The power plants at China Lake convert high temperature water into steam through a process called "flashing" and then use the steam to drive turbines that generate electricity. Each of the two plants contains three turbines. Each turbine has a production capacity of 30 megawatts, making the total production capacity 180 megawatts. See figure 2 for a diagram of how a power plant taps underground heat to produce geothermal electricity.

Figure 2: Diagram of a Geothermal Power Plant



Source: Navy.

Geothermal resources have not yet been fully utilized. In 1979, the U.S. Geological Survey estimated that known geothermal resources could provide 23,000 megawatts of power and that undiscovered resources might provide five times that amount. However, a comprehensive assessment of the nation's geothermal energy generation potential has not been conducted since 1979, and there is no current detailed information on the extent and location of geothermal resources in the United States. In a 2003 study by the Departments of Energy and Interior, the lead geothermal staff from each of BLM's state offices identified, based on their expert judgment, the best sites for future near term geothermal power development within their states. The BLM officials identified a total of 35 sites, including 10 in Nevada, 9 in California, 7 in Oregon, and the remainder in New Mexico, Utah, and Washington.[1] Also, in 2003, a Navy contractor assessed the geothermal energy potential on military lands. The contractor assessed

[1]See Barbara C. Farhar and Donna H. Heimiller, *Opportunities for Near-Term Geothermal Development on Public Lands in the Western United States* (Washington, D.C.: U.S. Department of Energy and U.S. Department of the Interior, April 2003) p. 6.

sites at 18 military bases and concluded that only 5 sites had a high potential for producing electricity from geothermal resources: the Nellis Air Force Base and the Fallon Naval Air Station/Dixie Valley Range in Nevada, the Naval Air Facility El Centro/Parachute Test Range in California, Fort Bliss in Texas, and the White Sands Missile Range in New Mexico.[2]

Navy's Revenues from Geothermal Energy Production Averaged about $14.7 Million Annually between 1987 and 2003

The Navy collected, on average, $14.7 million annually in royalties and other revenues from geothermal operations at its China Lake base between 1987 and 2003. A contract between the Navy and the power plant operator has established three sources of annual revenue to the Navy: (1) royalty payments on the sale of electricity, (2) payments toward the base's electricity bill, and (3) bonus payments for voluntarily conserving electricity usage at the base. In total, the power plant operator received about $2.3 billion from the sale of electricity produced by the China Lake power plants between 1987 and 2003 and has paid approximately $249 million, or about 11 percent, to the Navy.

The largest payment the Navy collects is a royalty on the power plant operator's gross revenue from selling electricity produced at China Lake. The Navy collected, on average, $11.5 million annually in royalties between 1987 and 2003.[3] Royalties ranged from a low of less than $100,000 in 1988 to a high of more than $20 million in 1996. The two power plants at China Lake each have three turbine units—units 1, 2, and 3 in Navy I and units 4, 5, and 6 in Navy II. The Navy assessed royalties on all power produced and sold from units 2 through 6 but not on power produced and sold from unit 1. Other arrangements, including payments toward the base's electricity bill, which are discussed later in this report, compensate the Navy for power sold from unit 1. Table 1 shows the annual royalties the Navy received from geothermal operations at China Lake.[4]

[2]See Innovative Technical Solutions, Inc., *Geothermal Energy Resource Assessment on Military Lands* (October 2003).

[3]Although the Navy did not begin receiving royalty payments until 1988, we averaged royalty payments over the period 1987 through 2003 to be consistent with our presentation of the other sources of geothermal revenues that were received throughout that period.

[4]Although the Navy received $194.9 million in royalty revenue, only about $191.5 million was available to the Navy to spend because it paid about $3.4 million to the power plant operator as reimbursement for paying more of the base's electricity bill than its agreement with the Navy required.

Table 1: Navy Royalty Revenue from China Lake Geothermal Operations, Calendar Years 1987-2003

Dollars in millions

Year	Royalty amount
1987	$0
1988	0.1
1989	1.6
1990	4.3
1991	5.2
1992	8.3
1993	9.7
1994	10.8
1995	18.4
1996	20.3
1997	18.3
1998	16.9
1999	19.1
2000	17.5
2001	17.7
2002	12.9
2003	13.9
Total	**$194.9[a]**

Source: GAO analysis of Navy data.

[a]Figures do not add up to the total because of rounding.

The Navy has established royalty rates in its contract with the power plant operator that increase incrementally from a low of 4 percent to a high of 20 percent. The Navy I and Navy II power plants have different royalty rates that increase in different years of the contract. Table 2 shows the schedule of royalty rates for the Navy I and Navy II power plants. The royalty rate for Navy I was first applied in 1988 and for Navy II in 1990.

Table 2: Schedule of Royalty Rates for China Lake Power Plants

Navy I power plant (units 2 and 3)		Navy II power plant (units 4-6)	
Years	**Percentage**	**Years**	**Percentage**
1-3	4	1-5	4
4-10	10	6-10	10
11-15	15	11-15	18
16-30	20	16-30	20

Source: GAO presentation of Navy data.

The Navy's royalty revenues rose consistently between 1988 and 1996 based on the 10-year contract price of electricity the power plant operator agreed to with the local utility (see table 1). However, since the mid-1990s these revenues have fallen from a high of $20.3 million in 1996 to $13.9 million in 2003, the most recent year for which complete data are available. This drop occurred because the price that the utility had agreed to pay for electricity from Navy I fell sharply in 1997 after the 10-year contract price expired. Similarly, the power plant operator's contract price for power sold from Navy II expired in 2000. The contract prices, while competitive when they were negotiated, were much higher than the market price for electricity when the contract prices expired. Since the Navy's royalties are directly related to the power plant operator's proceeds, when they dropped, the Navy's revenues also decreased. However, about the time the power plant operator's contract prices expired, the Navy's royalty rates increased from 10 percent to 15 and 18 percent, respectively, for electricity sold from each power plant. The increased royalty rates caused the Navy's royalty revenue to decline less dramatically than the power plant operator's proceeds from electricity sales.

The second largest Navy revenue source is the payment made by the power plant operator toward the China Lake base's electricity bill. The power plant operator paid, on average, $2.7 million annually toward the Navy's electricity bill between 1987 and 2003. These payments, which were made directly to the utility, lowered the base's electricity costs by about 26 percent annually. This arrangement compensates the Navy for some of the power produced and sold from unit 1 of the Navy I power plant, for which royalties do not apply. Unit 1 is different because the Navy originally intended that electricity produced from this unit would directly support the electricity needs of Navy bases in southern California through electric lines connecting the power plant and Navy facilities. However, the Navy changed its plans and instead decided to allow its contractor to sell all electricity

from unit 1 to the electric power grid and established a means of compensation that directly benefits the base at China Lake.

The third source of the Navy's geothermal revenues is the bonus payment for conserving electricity, known as the conserved power credit. These payments, which are another part of the Navy's compensation package for power sold from unit 1, averaged about $500,000 annually, for a total of $8.6 million from 1987 to 2003.[5] As shown in table 3, the Navy received the majority of the conserved power credit funds between 2001 and 2003.

Table 3: Conserved Power Credit Payments to the Navy, Calendar Years 1987-2003

Year	Conserved power credit amount
1987	$142,947
1988	88,031
1989	93,503
1990	98,497
1991	120,889
1992	134,698
1993	97,498
1994	123,482
1995	140,071
1996	79,373
1997	147,689
1998	245,250
1999	412,515
2000	389,528
2001	1,839,185
2002	2,519,103
2003	1,919,549
Total	**$8,591,808**

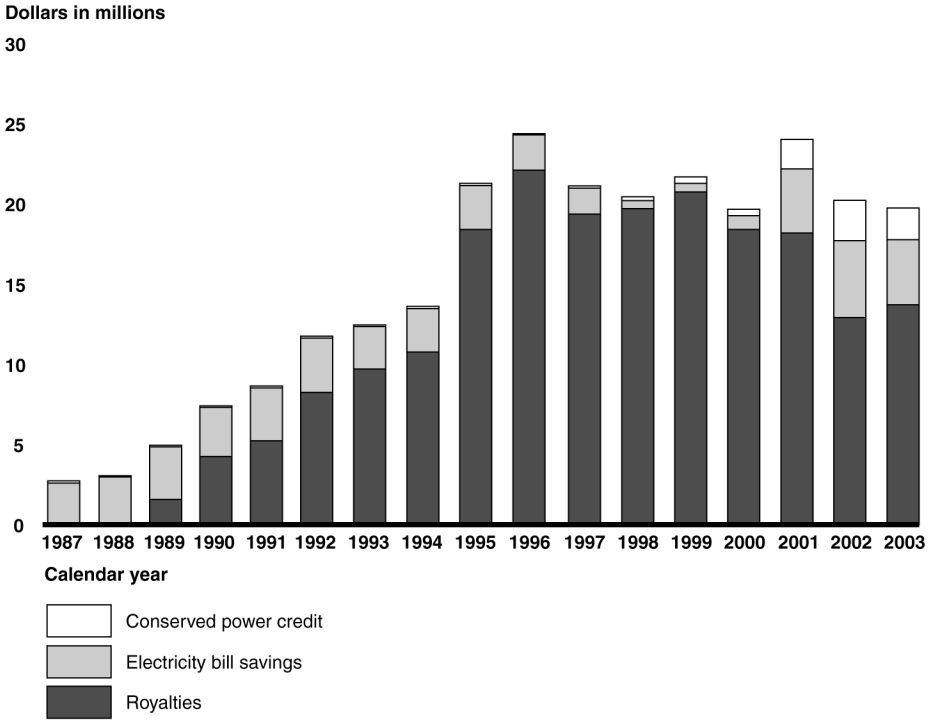
Source: GAO analysis of Navy data.

[5]Only about $5.5 million was available to the base to spend because the Navy paid about $3.1 million to the power plant operator as reimbursement for paying more of the base's electricity bill than its agreement with the Navy required between 1996 and 2001.

Under the conserved power credit agreement, the power plant operator pays the Navy a bonus if the China Lake base uses less electricity than predicted, based on an expected growth rate of 3 percent annually if the Navy took no steps to conserve energy. For example, if the contract projected the Navy's electricity needs at China Lake to be 100 kilowatt hours in 2004 and it uses 70 kilowatt hours, the Navy would receive a bonus payment for the 30 kilowatt hours it did not use. Since the power plant operator is partially responsible for paying the electricity costs of the base, this contract provision serves to limit its financial risk by providing an incentive for the Navy to lower its electricity use. Despite the intent of these payments to reward energy conservation at the base, the conserved power credit largely reflects the fact that the base has not grown as predicted and, therefore, its energy consumption has not grown significantly.

As shown in figure 3, the conserved power credit has become a more significant portion of the Navy's geothermal revenues since 2001.

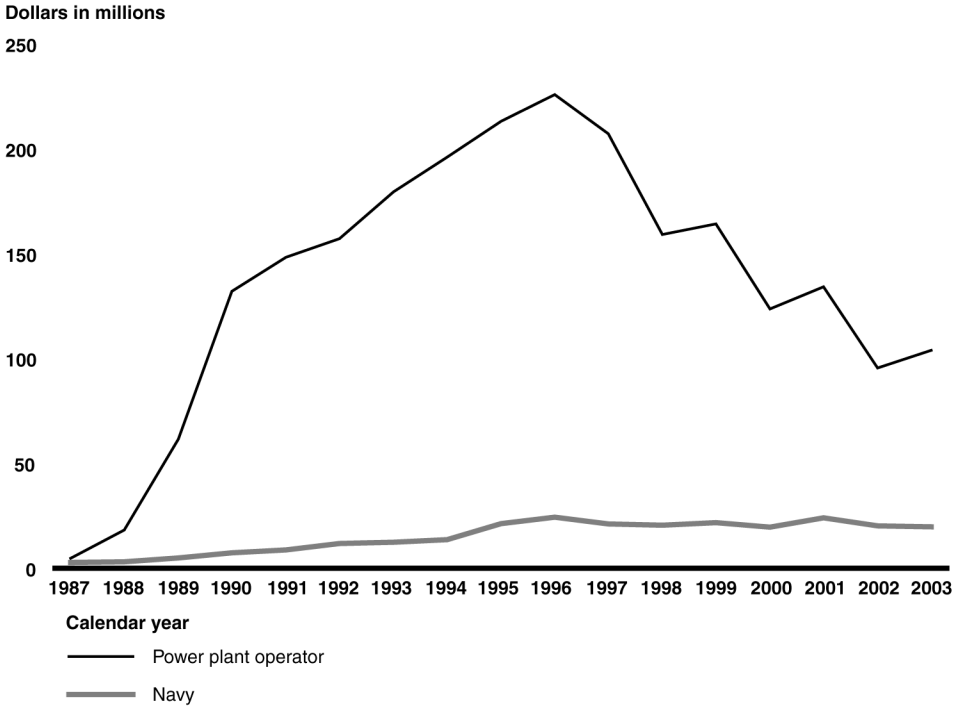
Figure 3: Navy Geothermal Revenue by Source, Calendar Years 1987-2003



Source: GAO analysis of Navy data.

This increase is the result of the formula used to calculate the price the Navy is paid for every kilowatt hour of electricity it saves. When the market price for electricity increases, as it did during the California energy crisis from 2000 to 2002, the price the Navy is paid for the electricity it conserves also increases. Payments the Navy received under this contract provision, as well as reductions in the base's electricity bill, have helped keep its total geothermal revenues fairly constant since the mid-1990s. During this same time period, revenue to the power plant operator declined significantly (see fig. 4).

Figure 4: Comparison of Power Plant Operator and Navy Revenue, Calendar Years 1987-2003



Source: GAO analysis of Navy data.

In addition to the three sources of annual revenue the Navy receives, the Navy will get a $25 million lump sum payment at the expiration of its contract with the power plant operator in 2009. This arrangement is the final part of the compensation package tied to unit 1 of the Navy I power plant. The Navy negotiated the $25 million payment because it calculated that the revenues it received from the electricity bill savings and the conserved power credit were less than the revenues it would have received if a royalty provision had been applied to unit 1.

Navy Has Spent Its Geothermal Revenues on Energy Conservation Programs and Oversight and Development of Geothermal Resources

Since fiscal year 1990, the first year the Navy spent geothermal revenues, most of the Navy's revenues have been used to develop and implement energy savings projects throughout the Navy and the Marine Corps and at the China Lake base. The Navy also funded its Geothermal Program Office, which manages the geothermal resource at China Lake and assesses other military sites for geothermal development. By the end of December 2003, the Navy had received a total of $197 million in cash geothermal revenues from royalties and the conserved power credit.[6] The Navy had spent about $182.3 million of its geothermal revenues and had an unspent balance of about $14.7 million.

Navy Has Spent Most of Its Geothermal Revenues on Energy Conservation Programs

Between October 1, 1989, and December 31, 2003, the Navy spent approximately $125.7 million, or about two-thirds of its expenditures of geothermal revenues, on 27 energy conservation programs, although not every program received funding every year.[7] The two largest Navy energy conservation programs funded with geothermal revenues are the Project Development and Execution program and the Utility Incentive program. Project Development and Execution program funds are used to identify energy savings projects throughout the Navy and Marine Corps, obtain proposals from contractors to execute the projects, review the financial and technical assumptions of their proposals, and execute the selected projects. Utility Incentive program funds enable base commanders to make down payments on contracts to implement energy savings projects and to review designs and oversee construction during the execution phase of the project. Funds from these two programs have been used to develop a project to install a large solar energy system and other energy technology at the Marine Corps' Twentynine Palms facility in California that, according to the Navy, effectively removed the facility's dependence on the power grid. The Navy also installed geothermal heat pumps that heat and cool a Marine Corps Air Station in Beaufort, South Carolina, as well as irrigation

[6]The third source of the Navy's annual geothermal revenue—the electricity bill savings—is not paid in cash to the Navy. Rather, the contractor pays the bill directly to the utility.

[7]The data we used to describe how the Navy spent its revenues from its geothermal operations represent the amounts the Navy obligated to programs and not the actual amounts expended. According to the Navy, tracking the actual expenses would have been prohibitively time-consuming since its accounting systems are not designed to sort expenses by program.

improvements by the Public Works Center in San Diego and at the Lemoore Naval Air Station in California, among other projects.

Among the other energy conservation programs the Navy funds from geothermal revenues are the Energy and Water Projects program, the Training program, and the Awareness program. Under the Energy and Water Projects program, the Navy installed energy efficient lighting systems in its buildings, such as sensors that detect movement and automatically turn on and off lights, as well as updated climate control systems. The Navy also installed metering upgrades that allow it to obtain energy consumption data for individual buildings, instead of for an entire base. Under its Training program, the Navy trains Navy and Marine Corps staff to be effective energy managers and to develop and finance energy savings projects, among other things. The Navy's Awareness program pays a public relations firm to emphasize the benefits of energy efficiency to Navy personnel. To help change attitudes and behaviors regarding energy conservation, the public relations firm produces a newsletter; writes speeches and reports; and disseminates promotional items, such as pads of paper with an energy efficiency message.

The Navy funded 22 other energy conservation programs between October 1, 1989, and December 31, 2003, using geothermal revenues, such as collecting and managing the Navy's energy consumption data, establishing an office to test and validate new energy savings technologies, creating a program to showcase energy savings features at Navy installations, and developing an awards program. Table 4 shows the Navy's energy conservation programs that received the highest levels of funding from geothermal revenues between October 1, 1989, and December 31, 2003.

Table 4: Navy's Energy Conservation Programs Receiving the Highest Level of Funding from Geothermal Revenues, October 1, 1989, through December 31, 2003

Dollars in millions

Program	Funding level
Project development and execution	$30.3
Utility incentive program	26.4
Energy and water projects	14.8
Training	8.8
Awareness	7.0
Other	38.5
Total	**$125.7[a]**

Source: GAO analysis of Navy data.

[a]Figures do not add up to the total because of rounding.

According to the Navy, its energy conservation efforts have resulted in significant energy savings. The Navy estimates that, since 1999, its geothermal revenues funded energy conservation projects that will save the Navy approximately $449 million over the life of the projects. In 2003, the Department of Energy presented the Navy the Presidential Award for Leadership in Federal Energy Management for its overall performance in energy management and energy savings, installation of renewable energy technologies, and development of reporting tools to better track energy use and cost. That same year, the Navy also received the Star of Energy Efficiency Award from the Alliance to Save Energy in recognition of the Navy's leadership in developing renewable energy, including the geothermal power plants at China Lake, two solar energy systems, and technology that uses wind and wave energy.[8]

The Navy has not spent all its geothermal revenues from China Lake. As of December 31, 2003, the Navy had about $14.7 million in unspent geothermal revenues. According to the Navy's Energy Program manager, the Navy carries over about $4 to $5 million from year to year to pay for expenses in the first month of the fiscal year. In addition, the Navy carries

[8]The Alliance to Save Energy is a nonprofit coalition of business, government, environmental, and consumer leaders organized to promote energy efficiency worldwide.

over funds that it was unable to obligate to programs before the end of the fiscal year.[9]

Navy Has Also Spent Its Geothermal Revenues to Oversee the China Lake Project and to Develop New Geothermal Resources

Between October 1, 1989, and December 31, 2003, the Navy spent about $56.6 million, or about the remaining one-third of its expenditures from geothermal revenues, on the Geothermal Program Office at China Lake. This office spent, on average, about $2.4 million annually to manage geothermal operations at China Lake and about $1.6 million to develop new geothermal resources at other military locations, for a total annual budget of about $4 million.[10]

The Navy's geothermal resource management activities include (1) monitoring key aspects of the China Lake geothermal reservoir, (2) overseeing the activities of the power plant operator, and (3) preserving historic and natural resources. The Navy's monitoring activities include testing how fluid moves underground and the temperature and pressure of subsurface water to help ensure the longevity of the geothermal resource. In addition, the Navy takes pressure and temperature readings from wells to understand the effects of withdrawing fluids from and injecting them into the reservoir. As a result of these monitoring activities, the Navy noticed a decrease in the volume of steam available to one of its power plants and worked with the power plant operator to correct it.

The Navy also oversees the activities of the power plant operator at China Lake to ensure the safety and security of power plant operations, as well as the operator's compliance with environmental laws and the agreements it entered into with the Navy. The Navy requires the power plant operator to prepare a resource management plan that details its plans for drilling wells, extracting steam, injecting fluids, and other aspects of resource management. To assess the power plant operator's compliance with the plan, the Navy inspects the power plants and reviews reports submitted by the operator. For example, the Navy reviews weekly reports on the amount of steam withdrawn from the reservoir, as well as the amount of electricity produced, sold, and lost.

[9]About $2.6 million of the unspent funds are managed by the Renewable Energy Program office at China Lake, which is responsible for identifying and executing renewable energy projects there and at a few other military installations. These funds originate from the conserved power credit.

[10]Averages are based on fiscal years 1990 through 2003.

Finally, the Navy takes actions to preserve natural and cultural resources on its lands. In the vicinity of the power plants at China Lake, there are natural resources, such as fumaroles (holes in the ground that emit volcanic gases) and bubbling mud pots, and cultural resources, such as an abandoned hot springs resort and a site with cultural significance to Native Americans. To help preserve these resources, the Navy has agreed to minimize surface disturbance; limit access to historic sites to only those with a need to be there; monitor and report on surface thermal features, such as fumaroles; and conduct a cultural resources site restoration study, among many other things.

The Navy's resource development activities involve identifying and quantifying the extent of geothermal resources at Army, Navy, Air Force, and Marine Corps bases. Specifically, the Geothermal Program Office (1) studies land density to detect the presence of water under the surface; (2) tests the physical and chemical makeup of the land and subsurface water; (3) conducts seismic surveys to identify fractures under the surface where hot water or steam could be accessible to drilling; and (4) drills shallow wells, fills them with water, and measures the temperature to detect the presence of underground heat. On the basis of information gathered from these activities, the Navy contracts with private companies to drill exploratory wells, which can be between 4,000 and 10,000 feet below the surface, to confirm the location and quality of geothermal resources. Labor costs for the Geothermal Program Office and for contracts with companies to perform additional work account for the vast majority of the Navy's geothermal resource development costs.

The Navy's resource development efforts have uncovered a developable geothermal resource at the Fallon Naval Air Station in Nevada. As of March 2004, the Navy was considering companies to develop a power plant on the base to produce electricity. According to the Navy, other locations where it has explored geothermal resources between 1987 and 2003 include the Fort Irwin Army base, the Twentynine Palms Marine Corps base, the Naval Air Field El Centro, and the Sierra Army Depot, all in California, the Hawthorne Army Ammunition Depot in Nevada, and the Lajes Air Force Base in the Azores.

Navy's Internal Energy Policy Board Oversees Budgeting of Most Geothermal Funds

The Navy's Shore Energy Policy Board oversees the budgeting of the Navy's about $11.5 million in average annual geothermal royalties. The members of the Navy's Shore Energy Policy Board include representatives of the Secretary of the Navy, the Chief of Naval Operations, the Commandant of the Marine Corps, and the Commander of Naval Installations.[11] The goal of the budget review process is to ensure that the Navy is funding programs that will allow it to meet its energy conservation obligations under the Energy Policy Act of 1992, as amended, and Executive Order 13123. The Energy Policy Act established a number of energy conservation goals and requirements for federal agencies, including requirements for new technology demonstration projects and surveys of energy savings potential. Executive Order 13123, which the President signed in 1999, sets goals for federal agencies to reduce greenhouse gas emissions and encourages agencies to expand the use of renewable energy by implementing renewable energy projects and by purchasing electricity from renewable energy sources, among other things.

Public Law 98-407 gives the Department of Defense authority to use its geothermal revenues to pay for energy costs and energy conservation projects. Consequently, the Navy's expenditures of its geothermal revenues are not subject to additional approval by external entities, such as the Office of Management and Budget or Congress.[12] However, according to the Navy's Energy Program manager, the Navy has informed interested members of Congress on an informal basis of the status of the geothermal program and the projects that are funded with geothermal revenues.

The annual budget development and review process for the Navy's geothermal expenditures is coordinated by the Navy's Energy Program manager. The process typically begins in the spring of each year with the individual program managers who receive funding from geothermal revenues identifying the activities they want to fund and the dollar amount

[11]The Secretary of the Navy is the politically appointed, civilian leader of the Navy responsible for setting policy, and the Chief of Naval Operations provides the highest level of operational, military leadership for the Navy.

[12]Geothermal revenue may also be used for certain military-related construction projects, provided advance notification is given to Congress. See 10 U.S.C. § 2867(c).

they want to allot to each activity.[13] The Navy's Energy Program manager also receives a projection from the Geothermal Program Office on the revenues expected from the geothermal facility at China Lake. The Navy's Energy Program manager then prepares a budget proposal that is presented to the Shore Energy Policy Board, typically at its annual meeting in the second half of each year. The board reviews the amounts allocated to each program in the draft budget, determines whether the funding levels are appropriate, agrees on final allocations, and approves the budget. As part of its review process, board members review data on program accomplishments from the previous year.

Once the board has agreed to the budget, the Navy's Energy Program manager submits a budget execution plan to the Controller at the Naval Facilities Engineering Command. The Navy's Energy Program office produces and provides to the Controller monthly reports showing how the geothermal revenues are being spent. The Controller is responsible for managing the account containing the geothermal revenues, making sure the money flows properly to the programs funded with these revenues, and ensuring that expenditures are properly accounted for.

The China Lake base's Renewable Energy Program office oversees the budget for the geothermal revenues that originate from the conserved power credit. Staff from the Renewable Energy Program office, working with the base's Energy Manager, identify potential energy conservation projects, such as energy efficiency upgrades to buildings or solar energy production at remote sites. The office determines which projects to fund on the basis of an assessment of multiple criteria, including the project's cost, available funds, maintenance requirements, and impact on energy savings goals.

[13]The program managers include those responsible for the Project Development and Execution program, the Utility Incentive program and the Geothermal Program Office, among others.

Navy's Geothermal Program Differs from BLM's Program in its Approach and in Some Key Contractual Provisions

The Navy's approach to developing and managing geothermal resources on military lands involves (1) making case-by-case decisions regarding development, (2) investing in the initial exploration to identify and characterize geothermal resources, (3) providing close and frequent oversight of geothermal resources in production, and (4) keeping all geothermal revenues for use by the military. This contrasts with BLM's standard approach, established by law and in regulations, which does not involve investing in geothermal exploration or provide the same level of oversight over resources in production. Also, 50 percent of BLM's geothermal revenues are shared with the states of origin. In addition to differences in their approaches, the Navy's contract at China Lake and BLM's leases have different royalty rates and contract renewal terms.

Navy Makes Case-by-Case Decisions Regarding Geothermal Development; BLM Uses a Standard Approach

The Navy and BLM use fundamentally different approaches to geothermal development. The Navy does not have a set of regulations that guide how geothermal development will take place on military land. Rather, according to the manager of the Navy's geothermal program, the Navy has chosen to make case-by-case decisions regarding geothermal development on military lands. This means that specific circumstances related to the nature of the geothermal resource, its location, and the Navy's energy and security needs, among other factors, will determine how the Navy chooses to develop the resource and the provisions that will be included in the development contract. Consequently, standard contract terms do not exist. Rather, a developer must negotiate with the Navy's Geothermal Program Office regarding the terms of the development contract, including the royalty rate, length of contract, and other provisions. BLM, on the other hand, has a standard approach to geothermal development with regulations that establish royalty rates, lease terms, and operational requirements of the leaseholder that are largely consistent across all geothermal leases.[14]

So far, the Navy's case-by-case approach has been completely applied only at China Lake. This contract was first signed in 1979 and has been modified over time as conditions have changed. For example, the Navy originally believed the electricity production potential at the site was much smaller and that the electricity would be provided only to the base. The contract was originally based on these assumptions but was modified when it became clear that additional production potential existed and that the

[14]See 43 C.F.R. part 3200.

electricity produced would be sold to a local utility company rather than supplied directly to the base. The Navy is currently in the process of developing the geothermal resources at the Fallon Naval Air Station using the same case-by-case approach. As a result, the contract provisions that are negotiated with the developer at Fallon may or may not be similar to those at China Lake.

Navy Invests in Initial Exploratory Work, and BLM Does Not

One of the most significant differences between Navy's and BLM's geothermal programs is that the Navy invests in exploratory work to identify promising geothermal resources, and BLM does not. According to a BLM official, the agency does not conduct the initial geothermal exploration on its lands because it has received neither direction nor funding from Congress to conduct such activities.

The area of highest risk and cost to geothermal developers is the initial exploration and identification of a high probability development site. At the China Lake and Fallon bases, the Navy assumed some of that risk and cost by funding and conducting the initial work to identify developable geothermal resources on these military installations. The Navy analyzed the characteristics of the rocks, variations in soil density, and the chemical characteristics of subsurface water, among other things, to determine the existence and characteristics of the geothermal resources at China Lake and Fallon. In addition, the Navy conducted some exploratory drilling, although it did not drill any wells that could be used for geothermal electricity production.

A representative of the company that currently operates the China Lake power plants told us that he did not believe that the Navy's initial exploratory work reduced the company's costs and risks significantly. On the other hand, representatives from the three companies that are interested in developing the geothermal resources at Fallon told us that the Navy's development work had reduced their initial risk and cost. Two of the representatives said they would not have been interested in being a partner in developing the geothermal resources at Fallon if they had to bear all of the initial cost and risk.

According to the Navy, it conducts the initial development work because (1) doing the work itself allows the military to limit access to its facilities, whose primary mission is national security; (2) the Navy has funds available for this purpose; and (3) doing its own development work increases the likelihood that geothermal energy companies will be

interested in the project. The Navy is interested in developing geothermal resources on military lands only if it can be done in a manner that does not impinge on its primary mission of national security. By conducting the initial exploration itself, or by using hired contractors, the Navy maintains much greater control over access to military facilities. The Navy is able to use this approach because it receives geothermal revenues from the China Lake power plants, a portion of which it spends to develop geothermal potential on other military facilities.

Navy Provides Closer and More Frequent Oversight of Its Geothermal Resources Than BLM Does

With proper management—not withdrawing too much fluid too fast and reinjecting fluids as needed—a geothermal field can potentially be productive indefinitely. In the absence of proper management, the productive life of the resource may be greatly reduced. The Navy has an interest in ensuring that the geothermal resource at China Lake is managed so that it will continue to produce electricity indefinitely. As a result, the Geothermal Program Office spends over one-half of its annual budget on oversight and management of the geothermal resource at China Lake.

To provide information to help it manage the geothermal resource, the Navy's contract with the power plant operator requires the company to annually submit to the Navy a resource management plan. This plan discusses how the company will develop the geothermal field and includes information on the drilling of new wells, changes to existing wells, and efforts to balance production and injection of fluids to maximize the field's productive capacity. The Navy also requires the power plant operator to provide weekly reports on various aspects of production, including well temperatures, well pressures, and steam flow. In addition, the Navy conducts some of its own tests of the geothermal resource to ensure it is being properly managed.

BLM's regulations also include provisions that require the leaseholder to manage the geothermal resource efficiently. One provision of the regulations states that a leaseholder's utilization operations must "result in the maximum ultimate recovery" of the geothermal resource.[15] Although BLM's regulations offer no further explanation of this concept, a BLM official told us that this means that leaseholders should engage in prudent management of the geothermal reservoir so that it will continue to be a

[15]See 43 C.F.R. § 3270.11.

viable resource for as long as possible. BLM performs some oversight activities to ensure that the leaseholder's operations ensure the longevity of the resource. For example, BLM's field office staff may check meters that monitor the pressure and temperature of the resource and compare trends over time, among other activities, to ensure the resource is not being depleted too quickly. However, because of its limited number of staff, BLM does not conduct these activities as frequently as the Navy does.

An official from the company that currently operates the power plants at China Lake told us that the level of oversight the Navy provides is burdensome and costly. According to the official, the Navy requires some reports about the company's management of the geothermal resource that either are not required by BLM or are required less often. The official told us that the company incurs approximately $50,000 in annual costs to comply with these requirements. Navy officials acknowledge that they require some reports more frequently than BLM and others BLM does not require at all. Nonetheless, they believe that these requirements are (1) part of a prudent approach to oversight, (2) consistent with the resource management principles in BLM's regulations, and (3) not as costly as the contractor contends. In addition, these requirements were not imposed unilaterally by the Navy but rather are included in the contract agreed to by the power plant operator and the Navy.

Navy Does Not Share Its Geothermal Revenues with State Government, and BLM Does

The Navy does not share its geothermal revenues with state or local governments, whereas the federal government returns half of the revenues from geothermal leases administered by BLM to the state of origin. The laws that established the military's authority to develop geothermal resources on its lands do not require the military to share any of its geothermal revenues with the state and local governments where the electricity was produced. In contrast, the Department of the Interior's Minerals Management Service, which is responsible for collecting and tracking geothermal royalty payments, is required by law to share 50 percent of the revenues from geothermal leases administered by BLM with the state of origin.[16]

California, the state which receives the majority of these geothermal revenues, shares 40 percent with the counties where the geothermal

[16]The one exception to this requirement is Alaska, which receives 90 percent. See 30 U.S.C. § 191.

development took place. In Nevada, the first $7 million in geothermal revenues received from the Minerals Management Service go into a state school account, and 75 percent of any funds over this amount are returned to the county of origin. Between 1987 and 2003, according to data from the Minerals Management Service, Nevada's geothermal royalties exceeded the $7 million threshold in only 1 year. Utah puts its geothermal revenues into a fund that makes grants and loans to local communities that have been socially or economically affected by the geothermal development for planning, construction, and maintenance of public facilities and provision of public services.

Navy's Royalty Rates Are, on Average, Higher Than BLM's Rates, and Contract Renewal Is at the Navy's Discretion

Currently, the Navy's only contract for geothermal development is at China Lake, and it includes royalty rates that are, on average, higher than BLM's royalty rate. In addition, the China Lake contract includes additional revenue provisions that are not included in BLM leases. To date, the average annual royalty rate the contractor has paid has been about 8 percent of its total revenues from the sale of electricity. This average rate will increase to 13.3 percent by the end of the contract because royalty rates are significantly higher at the end of the contract than at the beginning. The Navy's contract at China Lake also includes provisions for the developer to pay a portion of the base's electricity bill, payments if the base uses less electricity than expected, and an end-of-contract lump sum payment. According to the Navy, it was able to negotiate these provisions in part because of its initial investment in identifying the geothermal resource, which reduced the risk and cost to the developer.

According to an official from the Minerals Management Service, the royalty charged on BLM's leases is typically between 10 percent and 12.5 percent of the value of the geothermal hot water or steam. To compute this value, a company is allowed to deduct certain costs associated with turning the hot water or steam into electricity. The provisions that allow developers to deduct some of their costs—known as "netback" provisions—typically reduce the royalty rate paid on the value of the electricity to less than 12.5 percent. Exactly how much less is unknown because the Minerals Management Service does not calculate the average effective royalty rate on the value of electricity sold from BLM's geothermal leases. However, the lead official for BLM's geothermal program told us that the effective royalty rate was probably 4 to 4.5 percent of the value of the electricity.

Regarding contract extensions, whether the power plant operator's contract with the Navy at China Lake will be renewed is at the Navy's

discretion, whereas at BLM the lease will be routinely renewed as long as the leaseholder meets certain conditions. The China Lake power plant operator's 30-year contract with the Navy expires in 2009. The contract stipulates that at that time the Navy has the right, with congressional approval, to extend the contract for an additional 10 years. According to the power plant operator, uncertainty regarding whether the contract will be renewed makes it difficult for them to plan, make investments in plant maintenance, or explore new areas. In contrast, BLM leases have a primary term of 10 years. If the leaseholder uses geothermal resources in commercial quantities during this time, the lease will continue for up to 40 years beyond the initial term as long as commercial production continues.

Agency Comments and Our Evaluation

We provided the Department of Defense and the Department of the Interior's Bureau of Land Management a draft of our report for review and comment. In commenting for the Department of Defense, the Navy's Geothermal Program Office provided technical comments that we incorporated as appropriate.

In commenting for BLM, the Acting Assistant Secretary for Land and Minerals Management said that the report implies that BLM is not properly managing its geothermal program or providing an adequate level of oversight. In support of the view that BLM manages its leases "responsibly and efficiently," the Acting Assistant Secretary provided information about the program's budget, oversight, expenses, and staffing.

In response, we do not believe the report implies BLM is improperly managing its program. The report is limited to describing key differences between the two programs and, as noted in the report, does not compare their respective advantages and disadvantages or their costs and benefits. As such, the report does not address whether BLM's management and oversight are, or are not, proper. We made no changes in response to these comments. BLM also provided other technical comments which we addressed in appendix II.

We will send copies of this report to the Secretaries of the Navy and the Interior, the appropriate congressional committees, and other interested members of Congress. We also will make copies available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512- 3841. Key contributors to this report are listed in appendix III.

Jim Wells
Director, Natural Resources
and Environment

Scope and Methodology

To determine the Navy's annual revenues from the geothermal facility at China Lake, we reviewed the contract between the Navy and the power plant operator to identify all the forms of revenue to be paid to the Navy. We obtained and reviewed annual data prepared by the Navy's Geothermal Program Office on revenues from (1) royalties on the sale of electricity, (2) payments toward the base's electricity bill, and (3) payments for conserving electricity use at the base. We obtained revenue data for calendar years 1987, the first year the Navy collected geothermal revenues, through 2003, the most recent year for which complete data are available. We assessed the reliability of the Navy's revenue data by (1) comparing the annual revenues the Navy reported and the revenue the power plant operator reported it had paid to the Navy and (2) interviewing Navy officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of this report.

To determine how the Navy uses the revenues it collects from the geothermal facility, we obtained information from (1) the managers of the Navy's Energy Program and the Renewable Energy Program office at China Lake about the principal activities of the energy conservation programs funded with geothermal revenues and (2) the manager of the Geothermal Program Office on the principal activities conducted by this office. In addition, we obtained available annual expense data for fiscal year 1990, the first year it spent geothermal revenues, through the end of the first quarter of fiscal year 2004 from the Navy's Energy Program office, Renewable Energy Program office, and Geothermal Program Office. We assessed the reliability of the Navy's expenditure data by obtaining certifications that the Navy's financial system in use at the China Lake base was in compliance with (1) requirements of the Federal Financial Management Improvement Act of 1996 designed to improve federal agencies' financial reporting and (2) core financial system requirements of the Joint Financial Management Improvement Program.[1] To further assess the reliability of the data, we obtained descriptions of how financial transactions are approved, paid, and recorded, and checked records of transactions maintained by the Geothermal Program Office to determine whether the applicable policies had been followed. Finally, we interviewed Navy officials knowledgeable about the data, including the manager of the Navy's Energy Program office, the program manager of the Renewable

[1]The Joint Financial Management Improvement Program is a joint program of GAO, the Office of Management and Budget, the Office of Personnel Management, and the Department of the Treasury.

Energy Program office at China Lake, and the manager and business manager of the Geothermal Program Office. We determined that the data were sufficiently reliable for the purposes of this report.

To determine the budget oversight that the Navy provides programs funded from geothermal revenues, we examined federal statutes to determine the extent of the Navy's authority to use geothermal revenues. We discussed the Navy's oversight of geothermal funds with the Navy's Energy Program manager as well as the program manager of the Renewable Energy Program office at China Lake to determine how the Navy establishes spending priorities and makes funding decisions. We also reviewed minutes from meetings of the Navy's Shore Energy Policy Board, the highest level of oversight for the Navy's geothermal funds, as well as geothermal program information prepared for the board to determine the extent of its oversight activities. We did not evaluate the quality of the Navy's budget oversight because doing so was outside the scope of this review.

To determine how the Navy's geothermal program differs from BLM's program, we reviewed the contract between the Navy and its power plant operator at China Lake that establishes key elements of the Navy's approach to geothermal development and the law and regulations that establish BLM's approach. We also discussed the differences between the Navy's and BLM's geothermal programs with officials from (1) the Navy's Energy Program office and Geothermal Program Office; (2) BLM's headquarters, California, and Nevada offices; (3) the company that operates the power plant at China Lake; (4) other private energy companies; and (5) the Geothermal Energy Association. In addition, we visited the Navy's geothermal facility at China Lake to observe the activities of the Navy and the power plant operator. We also obtained information from the Navy on its geothermal exploration and development activities at the Fallon Naval Air Station. To verify the Navy's oversight requirements, we obtained reports the power plant operator submits to the Navy. Finally, we reviewed (1) the federal law that determines the extent to which the Minerals Management Service shares federal geothermal revenues with states and (2) the state laws for California, Nevada, and Utah that determine whether and how the states share geothermal revenues with local governments. We did not compare the advantages and disadvantages or the costs and benefits of the Navy's and BLM's geothermal programs because doing so was outside the scope of this review.

We did not conduct an assessment of the Navy's internal controls over its geothermal program, such as its procedures for planning and controlling

program activities or measuring and reporting program performance, because doing so was outside the scope of this review. We conducted our review from August 2003 through May 2004 in accordance with generally accepted government auditing standards.

Comments from the Bureau of Land Management

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Washington, DC 20240
http://www.blm.gov

TAKE PRIDE IN AMERICA

In Reply Refer To:
3200 (WO-310)

MAY 5 2004

Mr. Jim Wells
Director, Natural Resources and Environment
United States General Accounting Office
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Wells:

Thank you for the opportunity to comment on the General Accounting Office report entitled, *Geothermal Energy – Information on the Navy's Geothermal Program*. Your report's fourth objective was to "provide information on…how the Navy's geothermal program differs from the BLM's program." We found in the comparison, the report implies that the Bureau of Land Management (BLM) is not properly managing the geothermal program on public lands. We believe this is not true. The BLM manages over 400 leases and 34 power plants on Federal lands responsibly and efficiently. We provide the following comments.

1. The BLM's geothermal budget is developed and overseen at the Washington Office level, with input from field offices. The Department of the Interior (DOI), the Office of Management and Budget (OMB), and Congress provide oversight of the BLM's geothermal budget.

2. The BLM's total expenses to manage the geothermal program for years 1990 through 2003 are estimated at less than $10 million.

3. At the bottom of page 5 and the top of page 6, you indicate that the BLM's program had nine staff. In fact, the BLM has six employees who work full time in the geothermal program nationwide, and another seven employees with co-lateral duties to conduct lease sales, process permit applications, and conduct post-lease field work. For FY 2003, the BLM budget was $750,000, plus a one-time add on of $600,000, specifically directed to Nevada.

See comment 1.

4. The Navy manages the China Lake activities out of the Geothermal Program Office at the Weapons Center, with a 2003 budget of $2.4 million; the BLM Ridgecrest Field Office also manages two power plants on the same geologic structure, on the military withdrawn area, inside the boundary fences of the Weapons Center, with a geothermal budget of under $80,000 (part of the BLM's annual budget of $1.24 million).

5. BLM manages over 400 leases in seven states, and 15 field offices. The Navy has one field office.

6. The Navy manages two power plants, while the BLM manages 34 power plants.

2

7. The Navy manages its inspection program with a system of field visits by a number of employees (not cited in the report); the BLM accomplishes its China Lake inspection visits with one Ridgecrest Field Office employee. The employee inspects a power plant at Mammoth Lakes, five power plants at East Mesa, and occasionally is assisted by an engineer from the BLM's Ukiah Field Office.

8. The BLM uses another employee to manage 16 other federal geothermal power plants within the Geysers, another geothermal field in California. The Geyers is the largest producing geothermal steam field in the world.

9. The Navy retains all revenues generated by the China Lake geothermal facilities. By law, 50 percent of the royalties from production on public lands administered by the BLM are returned to the State of California. Over $6 million of these funds have been paid to the local Inyo County government for schools, court and county buildings, fire protection, and transportation.

10. Your report neglects to point out that the Navy's geothermal program had a large budget "to develop new geothermal resources on other military facilities". No other facilities or power plants have been built or brought on-line since inception of the program in the late 1970's.

See comment 2.

11. The report incorrectly states on page 4 that the "...BLM does not conduct any work to identify geothermal resources on the lands it administers." The BLM identifies lands with high geothermal resource values as Known Geothermal Resource Areas (KGRAs). The BLM uses its own geologic expertise supplemented by other information from the U. S. Geological Survey, Department of Energy, State Government and other sources. This work, and the analysis which is required to keep this information current is referenced in the Geothermal Steam Act which describes KGRAs as areas where the geology, nearby discoveries, or other indicia would, in the opinion of the Secretary of the Interior, encourage and support companies with geothermal experience to lease and develop the lands. Industry has continually expressed the positive value of the BLM's work, especially when the companies apply for bank financing.

See comment 3.
Now on pp. 4 and 23.

12. On pages 4 and 21, the report states that, "The Navy makes case-by-case decisions regarding geothermal development." The report does not mention that BLM also makes case-by-case decisions for leasing and development. Similar to the Navy's decision to lease based on compatibility with military base missions, the BLM makes case-by-case leasing decisions based on compatibility with public land management objectives, including the protection and use of other resources. The leasing contract, which the BLM uses to authorize activities on public lands for exploration and development, contains many standard provisions, such as royalty rates and lease terms, which are set by regulation and statute. However, the BLM also develops and includes additional stipulations and operational conditions in each authorization, based on specific conditions that are identified on a case-by-case basis. These include measures to protect cultural values, threatened and endangered species, lessen visual impacts and mitigate other impacts identified during the National Environmental Policy Act analysis.

13. In several places, including in the introductory Highlights Page, your report indicates that the BLM does not "provide the same level of oversight over resources in production." This statement may lead readers to believe that the BLM's level of oversight is inadequate, which is not accurate. While the report states that the Navy inspects

operations more frequently than the BLM, the BLM does, and will, adapt its inspection schedule where situations indicate a need for more frequent inspections. BLM employs some of the best petroleum engineers and geothermal experts in the country to ensure that geothermal production accountability, reservoir management (which includes measures taken to conserve the productivity of the resource), as well as drainage protection, are effectively and efficiently addressed. We believe that BLM's level of oversight is appropriate, and indeed, exemplary given limited resources.

In conclusion, we thank you for this opportunity to review this report. If you have any further questions, please call our Acting BLM Fluid Minerals Group Manager, Mr. Kermit Witherbee, at 202-452-0385.

Sincerely,

Rebecca W. Watson
Assistant Secretary
Land and Minerals Management
(Acting)

cc: Mr. Steve Secrist
Assistant Director
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301 Howard Street
San Francisco, CA 94105

The following are GAO's comments on three technical areas contained in the Bureau of Land Management's letter dated May 5, 2004.

GAO Comments

1. In commenting for BLM, the Acting Assistant Secretary implied that the Navy spent $2.4 million and BLM spent less than $80,000 in fiscal year 2003 to perform the same level of work to oversee their respective power plants at China Lake. To clarify, as we reported, the $2.4 million figure is not the amount the Navy spent in fiscal year 2003, but the average annual amount it spent over about a 14-year period to manage geothermal operations at China Lake. In addition, we do not believe that the budgets of the Navy and BLM for managing oversight activities at China Lake can be reasonably compared, as BLM suggests, because the level of oversight performed by each entity is different. For example, BLM and the Navy entered into a memorandum of understanding to jointly manage the geothermal resource at China Lake. This agreement, while not discussed in our report, gives the Navy lead responsibility for managing the geothermal resource at China Lake. We made no changes to our report in response to this comment.

2. We clarified our report to make clear that BLM does not invest in exploratory work to identify the location of developable geothermal resources. The work BLM performs to identify geothermal resources prior to offering land for leasing is to analyze data from third parties, such as universities and research laboratories, to determine whether broad areas of land can be designated as KGRAs. However, a BLM official with extensive experience with BLM's geothermal program in California, told us the data the agency uses to make KGRA designations are not conclusive as to whether the underlying resource is commercially viable, a determination that is important to energy developers.

3. We believe that BLM's approach to developing geothermal resources is fundamentally different than the Navy's approach. BLM's approach is predominately determined by law and regulations, whereas the Navy's approach is predominately determined by the specifics of each individual case. As such, we believe that we have accurately characterized their respective approaches and made no changes for this comment.

GAO Contact and Staff Acknowledgments

GAO Contact

Jim Wells (202) 512-3841

Staff Acknowledgments

In addition to the individual named above, Nancy Crothers, Dan Haas, Steve Secrist, Kathryn Supinski, and Barbara Timmerman made key contributions to this report.

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