

# CHAPTER I

## PURPOSE OF AND NEED FOR ACTION

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# CHAPTER I

## PURPOSE OF AND NEED FOR ACTION

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### I.1 INTRODUCTION

The goal of this project is to make geothermal leasing decisions on pending lease applications submitted prior to January 1, 2005 and to facilitate geothermal leasing decisions on other existing and future lease applications and nominations. Geothermal resources are abundant in the western United States (US) and have high potential for providing reliable base demand electrical generation and “direct use” heating applications. Recent Federal and state policies and advances in engineering and technology have increased the demand for accessing geothermal resources. Federal lands in the continental US contain about 46 percent of the nation’s geothermal resources, and about 70 percent of Federal lands have potential for geothermal development, defined as heat flow above 140° Fahrenheit (F) (60° Celsius [C]) (Energy Information Administration 2007). Obtaining leases and development permits on Federal lands has been identified as a significant barrier for geothermal developers (Farhar 2000; Western Governors’ Association 2006; Geothermal Energy Association 2007a). A notable constraint to leasing on Federal lands is that many land use plans and their associated environmental analyses do not adequately address geothermal resources, thereby requiring a land use plan amendment before geothermal resources can be leased. This constraint has resulted in a number of backlogged lease applications that require processing.

**Public Lands:**

Lands administered by the BLM.

**National Forest System Lands:**

Lands administered by the FS.

**National Park System Lands:**

Lands administered by the National Park Service are closed to geothermal leasing.

In accordance with the Energy Policy Act (EPAAct) of 2005 (Public Law 109-58, August 8, 2005), the US Department of the Interior (DOI), Bureau of Land Management (BLM) and the US Department of Agriculture (USDA), Forest Service (FS) propose to facilitate geothermal leasing on lands administered by the BLM (termed “public lands”) and the FS (National Forest System [NFS] lands) that have geothermal potential in the 12 western states, including Alaska. Tribal lands and Federal lands within units of the National Wildlife Refuge System and National Park System are closed to geothermal leasing. Public and NFS lands in proximity to a National Park System unit with a “significant thermal feature” require special analysis prior to issuance of geothermal leases.

Under the proposal, the BLM and FS would do the following:

- (1) Identify public and NFS lands with geothermal potential as being legally open or closed to leasing.
- (2) Issue or deny geothermal lease applications pending as of January 1, 2005.

Under the proposal, the BLM would also do the following:

- (3) Identify public lands that are administratively closed or open, and under what conditions.
- (4) Develop a comprehensive list of stipulations, best management practices, and procedures to serve as consistent guidance for future geothermal leasing and development on public and NFS lands.
- (5) Amend BLM land use plans to adopt the resource allocations, stipulations, best management practices, and procedures.

Approving the leasing and development of geothermal resources on public and NFS lands is a Federal action and requires analysis under the National Environmental Policy Act of 1969 (NEPA). This programmatic environmental impact statement (PEIS) evaluates the potential environmental, social, and economic effects of these actions in accordance with the NEPA, the Council on Environmental Quality's regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500–1508), and applicable BLM and FS authorities. This PEIS presents broad impacts associated with the proposed action and alternatives to the proposed action. Programmatic evaluations are generally done for planning-level actions over large geographic areas (40 CFR 1502.4), which is appropriate for the proposed action. However, issuing decisions on the pending geothermal backlogged lease applications requires more lease-specific analysis, which is provided in Volume II of the PEIS.

This chapter describes the purpose of the proposed action and the need that is driving this process. This chapter also provides background on geothermal resources and how they are utilized, and a description of the process by which Federal geothermal resources are leased.

## **I.2 PURPOSE OF THE ACTION**

The purpose of the proposed action is threefold:

1. To complete processing active pending geothermal lease applications and nominations by deciding whether, and under what stipulations, to issue geothermal leases on NFS and public lands.
2. To amend BLM land use plans to allocate BLM-administered lands with geothermal resource potential as closed, open, or open with major or moderate constraints to geothermal leasing. This includes establishing a projected new level of potential geothermal development with existing planning level decisions (termed

reasonably foreseeable development scenario), and identifying appropriate stipulations, best management practices, and procedures to protect other resource values and uses while providing sufficient pre-leasing analysis to enable the BLM to make future competitive geothermal leasing availability decisions.

3. To provide suitable information to the FS to facilitate its subsequent consent decision to the BLM for leasing on NFS lands. Provide environmental analysis to assist future National Forest land use decisions by providing possible land use allocations and stipulations for geothermal leasing.

### **I.3 NEED FOR THE ACTION**

There are three needs for the Federal action:

1. To issue decisions on pending lease applications in accordance with the EAct of 2005. Specifically, Section 225 requires that the Secretary of Interior and Secretary of Agriculture establish a program for reducing by 90 percent the backlog of geothermal lease applications that were pending as of January 1, 2005. The EAct of 2005 mandates that action be taken by August 8, 2010.
2. To address other provisions of the EAct of 2005 (Sections 211 and 222[d][1]); respond to other policy directives calling for clean and renewable energy (see Section 1.8 Renewable Energy Policies); and to meet the increasing energy demands of the nation while reducing reliance on foreign energy imports, reducing greenhouse gas emissions, and improving national security.
3. To facilitate geothermal resource leasing in an environmentally responsible manner to help meet the increasing interest in geothermal energy development on public and NFS lands in the western US (EAct Section 211).

### **I.4 BACKGROUND FOR GEOTHERMAL RESOURCES**

The term *geothermal* comes from the Greek *geo* meaning “earth” and *thermal* meaning “heat.” As such, geothermal energy is energy derived from the natural heat of the earth. Geothermal resources are typically underground reservoirs of hot water or steam created by heat from the earth, but geothermal resources also include subsurface areas of dry hot rock. In cases where the reservoir is dry hot rock, the energy is captured through the injection of cool water from the surface, which is then heated by the hot rock and extracted as fluid or steam. Geothermal steam and hot water can naturally reach the earth’s surface in the form of hot springs, geysers, mud pots, or steam vents. Geothermal reservoirs of hot water are also found at various depths beneath the Earth’s surface. In the US, most geothermal reservoirs are located in the western states, Alaska, and Hawaii (NREL 2007). Geothermal resources can be accessed by wells and used to provide heat directly. This is called the *direct use* of

geothermal energy. The heat energy can also be used to commercially generate electricity; a process called *indirect use*. As shown on Figure I-1, there are a wide range of uses for geothermal resources.

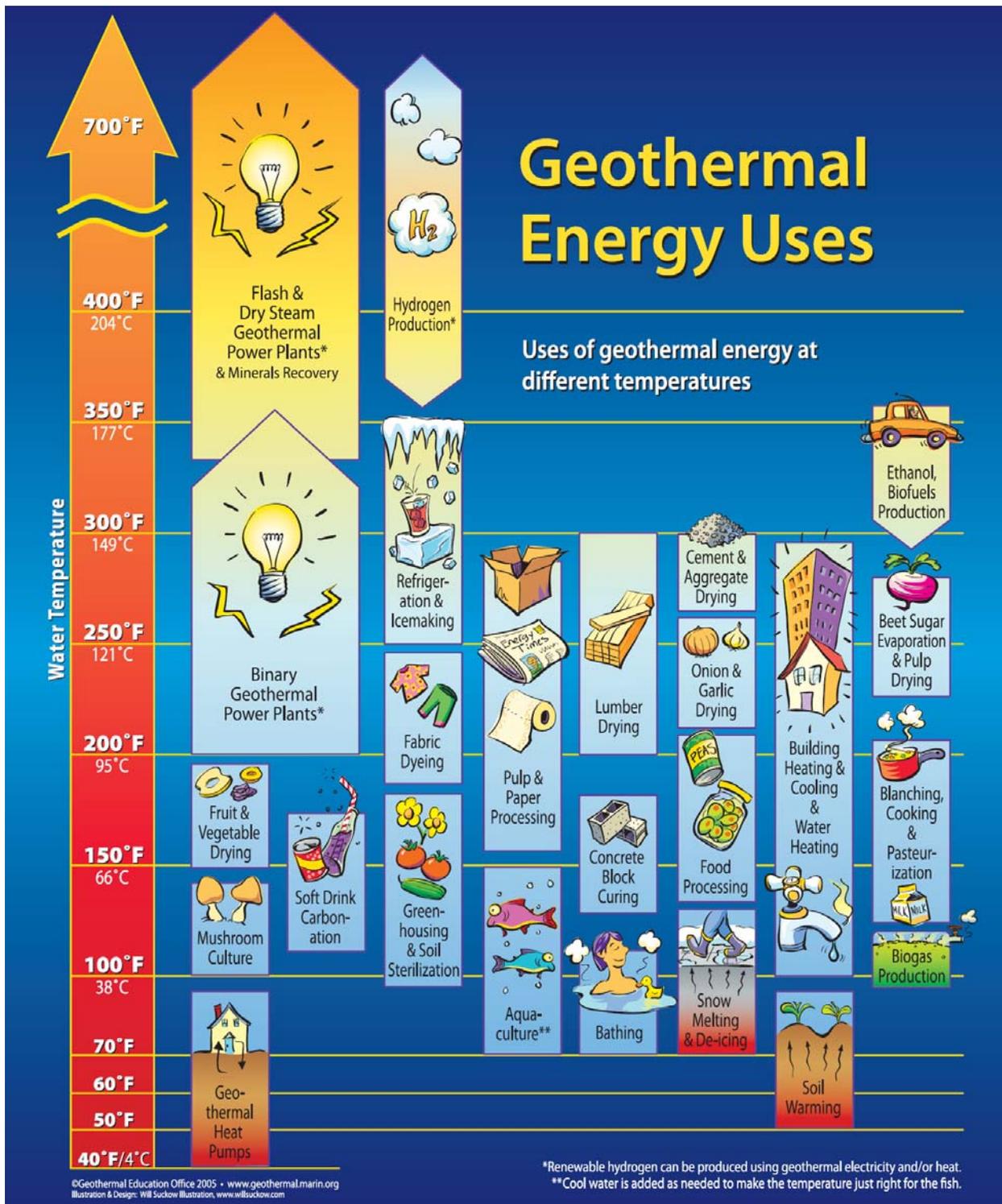
#### **I.4.1 Direct Use**

Humans have been using geothermal resources in the form of hot springs for thousands of years. Today, geothermal reservoirs of low- to moderate-temperature water – 68°F to 302°F (20°C to 150°C) – provide numerous opportunities for direct use. Direct use means utilization of geothermal resources for commercial, residential, agricultural, public facilities, or other energy needs other than the commercial production of electricity (43 CFR 3200.1). Direct use includes using heat energy from naturally occurring hot water or using other technology to capture the heat from the earth (e.g., heat pumps). Modern hot water direct-use systems access geothermal reservoirs by drilling into them from the surface to develop a steady stream of hot water. The water is brought up through the well, and a mechanical system consisting of piping, a heat exchanger, and controls delivers the heat directly for its intended use. A disposal system then either injects the cooled water underground or disposes of it on the surface.

Geothermal energy is used as heat in the US, either directly or through the use of ground-source heat pumps, for a variety of applications, such as:

- Heating pools, spas, greenhouses, aquaculture facilities, and buildings;
- Melting snow on sidewalks and driveways; and
- Drying agricultural products.

Direct use applications in the US have been growing at about six percent per year (Lund 2003). These low-temperature resources are fairly abundant throughout the West. A recent survey of 10 western states identified more than 9,000 thermal wells and springs, more than 900 low- to moderate-temperature geothermal resource areas, and hundreds of direct-use sites (Western Governors' Association 2006).



C://EMPSI/Geothermal/PEIS/Figures

Geothermal energy has many uses, including heating, agriculture, and commercial electrical generation.

SOURCE: Geothermal Education Office 2005

## Uses of Geothermal Energy

Figure I-1

### 1.4.2 Commercial Electrical Generation

Commercial electrical generation from geothermal resources is also called *indirect use*. Electrical generation uses geothermally heated fluid to turn a turbine connected to a generator. As discussed below, the fluid may be the naturally occurring steam or water in the geothermal reservoir or another fluid which has the geothermal heat transferred through a heat exchange system.

#### What's a Watt?

A watt is the International System of Units standard unit of power and is the equivalent of one joule per second.

Kilowatt = 1,000 watts

Megawatt = 1,000 kilowatts

Gigawatt = 1,000 megawatts

#### Fast Facts:

- ✓ One megawatt serves about 1,000 homes in the US.
- ✓ The western US generates about 2,400 megawatts from geothermal resources annually.

Geothermal energy produces about 2,400 megawatts annually in the western US, supplying less than one percent of the US electrical demand (Energy Information Administration 2007). It is estimated that the 12 Western states have 5,500 MW of geothermal potential considered viable for commercial development by 2015, with a further 6,600 MW being forecast by 2025 (Section 2.6 discusses the reasonably foreseeable development scenario for electrical development).

Geothermal power plants can be small (300 kilowatts), medium (10 to 50 megawatts) and large (50 megawatts and higher) (Nemzer *et al.* 2007). Generation capacity is guided by the number of turbines within a plant. In general, commercial electrical generation requires hot geothermal reservoirs with a water temperature above 200°F (93°C); however, new technologies have proven that lower-temperature water (e.g., 165°F [74°C]) can also be used for electrical generation.

Three types of geothermal power plant systems are commonly used to generate electricity depending on temperature, depth, and quality of the water and steam in the area (US Department of Energy [DOE] 2007a):

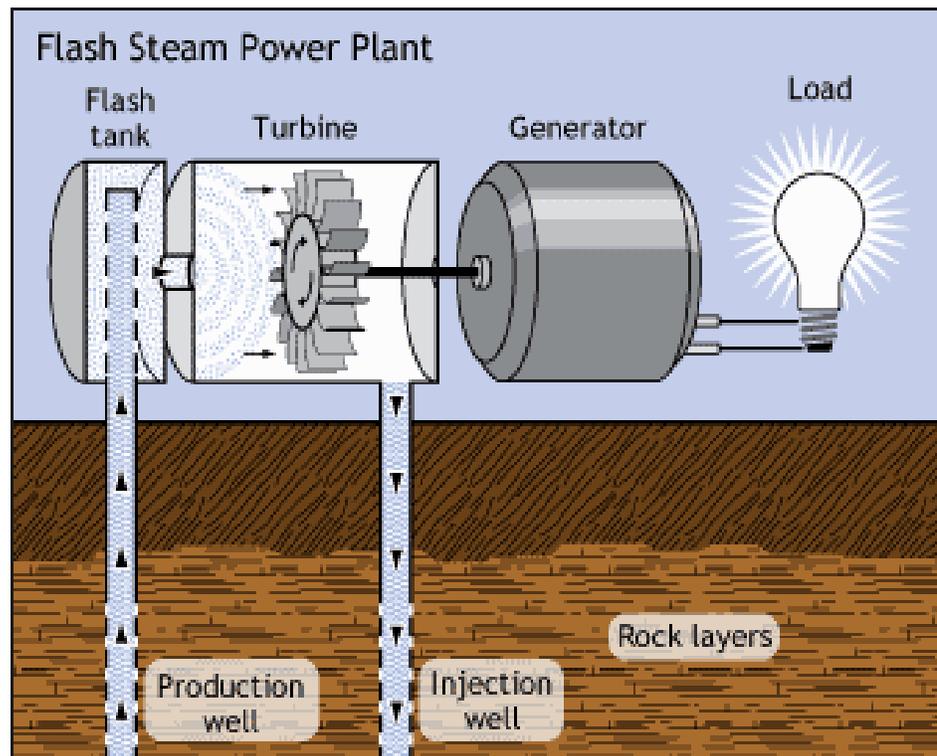
- (1) flash steam;
- (2) binary-cycle; and
- (3) dry steam power plants.

These plants can also be hybridized by including elements of the different technologies at a single location. All three methods reinject the remaining geothermal fluid back into the ground to replenish the reservoir and recycle the hot water.

### **Flash Steam Power Plants**

Flash steam power plants use hot water above 360°F (182°C) from geothermal reservoirs. The high pressure underground keeps the water in the liquid state, although it is well above water's boiling point at standard atmospheric pressure. As the water is pumped from the reservoir to the power plant, the drop in pressure causes the water to convert, or "flash," into steam to power the turbine (Figure I-2, Flash Steam Power Plant). Any water not converted into steam is injected back into the reservoir for reuse. Flash steam plants, like dry steam plants, emit small amounts of gases and steam. Flash steam plants are the most common type of geothermal power generation plants currently in operation (US DOE 2007a).

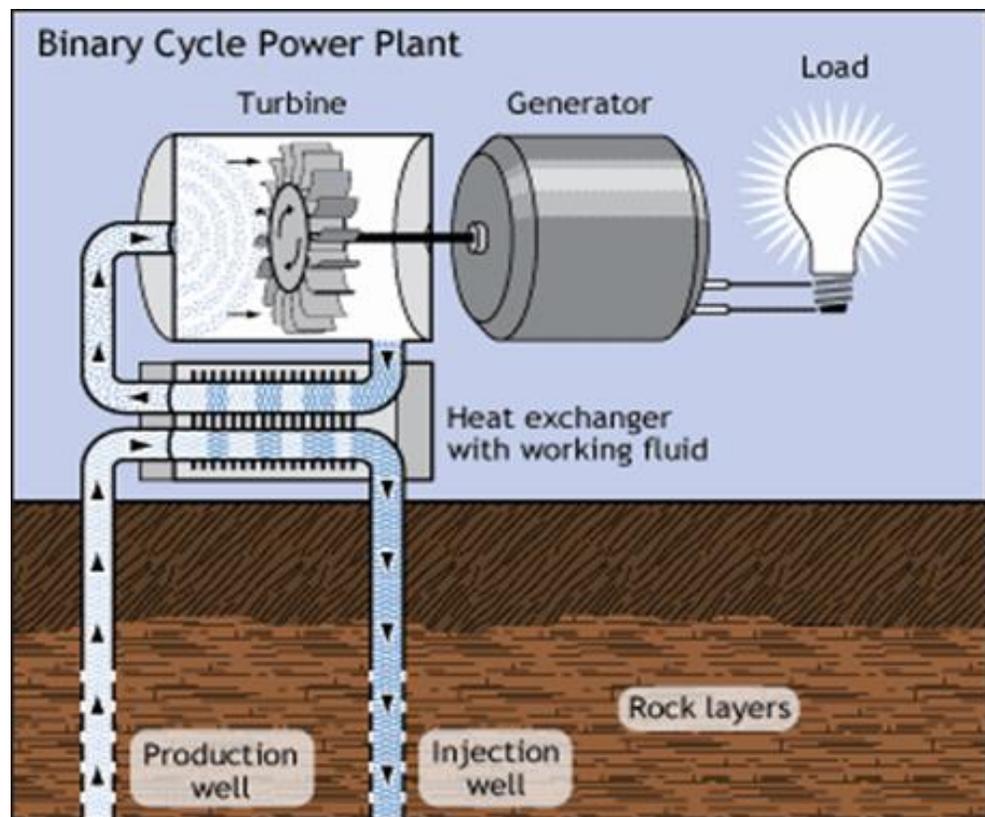
**Figure I-2  
Flash Steam Power Plant**



### Binary Cycle Power Plants

Binary-cycle power plants typically use cooler fluids than flash steam plants (165 to 360°F [74 to 182°C]). The hot fluid from geothermal reservoirs is passed through a heat exchanger, which transfers heat to a separate pipe containing fluids with a much lower boiling point. These fluids, usually iso-butane or iso-pentane, are vaporized to power the turbine (Figure 1-3, Binary-cycle Power Plant). The advantage of binary-cycle power plants is their lower cost and increased efficiency. These plants also do not emit any excess gas and, because they use fluids with a lower boiling point than water, are able to use lower-temperature geothermal reservoirs, which are much more common. Most geothermal power plants planned for construction in the US are binary-cycle (US DOE 2007a).

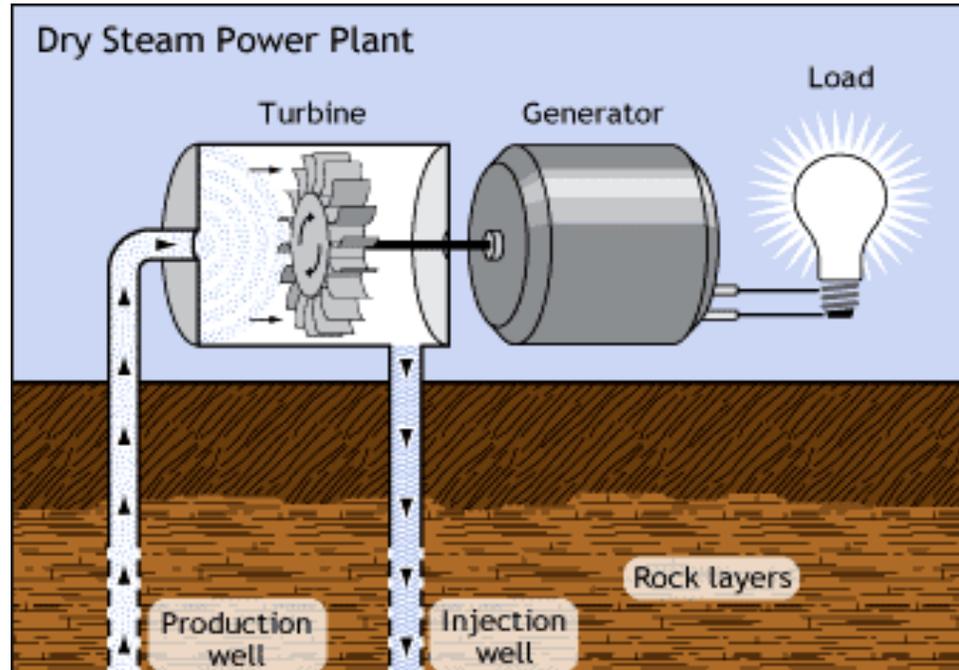
**Figure 1-3**  
**Binary Cycle Power Plant**



### **Dry Steam Power Plants**

Dry steam power plants use very hot (>455°F [235°C]) geothermal reservoirs that exist primarily in the form of steam. The steam is routed to the surface via a well and used to turn a turbine. The turbine drives a generator that produces electricity (Figure I-4, Dry Steam Power Plant). While this is the rarest form of power plants, it was both the first type of geothermal reservoir used to produce electricity (at Lardarello, Italy, in 1904) and is the reservoir type being used at the world's largest geothermal production site, The Geysers in Northern California. Dry steam power plants emit only excess steam and very minor amounts of gases (US DOE 2007a). Geothermal sources with dry steam generation capability are very rare.

**Figure I-4  
Dry Steam Power Plant**



### **Emerging Technologies**

#### *Geothermal Energy from Oil and Gas Production*

Oil and gas wells are typically thousands of feet deep and often produce very hot fluid. Along with the oil and gas, wells produce water that must be separated from the oil and gas and usually reinjected deep below domestic aquifers. The Rocky Mountain Oilfield Testing Center, located in the Teapot Dome Oilfield near Casper, Wyoming, is demonstrating the use of warm reservoir fluids from oil and gas production to produce electricity that can be used to power the oil and gas pumps (Rocky Mountain Oilfield Testing Center 2007). This technique is referred to as co-produced geothermal fluids or

produced water cut (NREL 2006). Because the electricity is used on site, there is no need to purchase additional electricity which eliminates the need for power lines to be run to oil and gas facilities. This technology could be applied at many oil and gas facilities throughout the West.

#### *Enhanced Geothermal Systems*

Enhanced geothermal systems are engineered reservoirs created to produce energy from geothermal resources deficient in water and/or permeability (US DOE 2007b; US DOE 2006). With enhanced geothermal systems, a developing reservoir is targeted within a volume of rock that is hot and tectonically stressed. Through a combination of hydraulic, thermal, and chemical processes, the reservoir can be stimulated, causing fractures to open, extend, and interconnect. This creates a fluid-conductive fracture network and an interconnected reservoir system. The process can extend the margins of existing geothermal systems or can create entirely new ones wherever optimal thermal and tectonic conditions exist (University of Utah Energy and Geoscience Institute) 2007). Enhanced geothermal systems technology is relatively new in the geothermal field and has been found to have great potential for providing electrical power; one study found the potential for 100 gigawatts of power (US DOE 2006). Until recently, lack of research and development funding, government policies, and lack of incentives had not favored the growth of enhanced geothermal systems, with most development occurring outside of the United States (US DOE 2006). It is anticipated that there may be applications for research and development drilling on public and NFS lands in the future. Until it becomes a technically and economically proven technology, it is unlikely that it will be applied at a large scale in the western US within the next 20 years.

## **I.5 LEASING AND DEVELOPMENT PROCESS OF GEOTHERMAL RESOURCES ON FEDERAL LANDS**

### **I.5.1 Geothermal Leasing Laws and Regulations**

A geothermal lease is for the heat resource of the earth where there is Federal mineral estate. Unless specifically owned in fee, the Federal government does not own the hot water commonly associated with the heat; this falls under state water laws. Geothermal developers must obtain the appropriate water rights and state permits, in addition to the Federal lease for the resource.

The BLM has the delegated authority to issue geothermal leases on Federal lands. The BLM currently administers about 480 geothermal leases that covered over 700,000 acres at the end of fiscal year 2007. Of those 57 are producing geothermal energy, 54 producing resource for electrical generation and 3 for direct use (BLM 2008b). It is the policy of the Federal government, consistent with Section 2 of the Mining and Mineral Policy Act of 1970 and Sections 102(a)(7), (8), and (12) of the Federal Land Policy and Management Act of 1976 (FLPMA) (43 US Code [USC] 1701 et seq.), to encourage the development of

mineral resources, including geothermal resources, on Federal lands. The Geothermal Steam Act of 1970 (30 USC Section 1001, *et seq.*), which was amended and supplemented by the EAct of 2005, provides statutory guidance for geothermal leasing by the BLM. New Federal geothermal development regulations (43 CFR Parts 3000, 3200, and 3280 – Geothermal Resource Leasing and Geothermal Resources Unit Agreements) were made effective June 1, 2007 (72 Fed Reg. 24358, May 2, 2007), as a result of a directive provided in the EAct of 2005. These statutes and regulations delineate lands that are available and unavailable for leasing.

### **1.5.2 Available and Unavailable Lands for Geothermal Leasing**

In accordance with the Geothermal Steam Act of 1970, as amended (30 USC Section 1001) and the Geothermal Resources Leasing Rule (43 CFR 3201.10), the BLM may issue leases on the following “available” lands:

- Lands administered by the DOI, including public and acquired lands not withdrawn from such use;
- Lands administered by the USDA with its concurrence;
- Lands conveyed by the US where the geothermal resources were reserved to the US; and
- Lands subject to Section 24 of the Federal Power Act, as amended (16 USC 818), with the concurrence of the Secretary of Energy.

Conversely, the BLM is prohibited from issuing leases on the following statutorily closed Federal lands as defined in the Geothermal Resources Leasing Rule (43 CFR 3201.11). Other lands administered directly by the BLM and FS may also be closed through other authorities, which are discussed in Chapter 2.

- Lands where the Secretary of Interior (Secretary) has determined that issuing the lease would cause unnecessary or undue degradation of public lands and resources;
- Lands contained within a unit of the National Park System, or that are otherwise administered by the National Park Service;
- Lands where the Secretary determines after notice and comment that geothermal operations, including exploration, development, or utilization of lands, are reasonably likely to result in a significant adverse effect on a significant thermal feature within a unit of the National Park System;
- Lands within a National Recreation Area;
- Fish hatcheries or wildlife management areas administered by the Secretary;
- Indian trust or restricted lands within or outside the boundaries of Indian reservations;

- The Island Park Geothermal Area (in Idaho and Montana); and
- Lands where Section 43 of the Mineral Leasing Act (30 USC 226-3) prohibits geothermal leasing, including:
  - Wilderness areas or Wilderness Study Areas administered by the BLM or other surface-management agencies;
  - Lands designated by Congress as Wilderness Study Areas, except where the statute designating the study area specifically allows leasing to continue; and
  - Lands within areas allocated for wilderness or further planning in Executive Communication 1504, Ninety-sixth Congress (House Document 96-119), unless such lands are allocated to uses other than wilderness by a land and resource management plan or are released to uses other than wilderness by an act of Congress.

### **1.5.3 Leasing Process, Rights, and Limitations**

The BLM grants access to geothermal resources through a formalized leasing process based on the end use. For direct uses, an applicant can apply noncompetitively for a lease. For indirect use, such as commercial electrical generation, the BLM awards leases through a competitive bidding process. Historically, certain lands were designated as known geothermal resource areas (KGRAs). All lands designated within KGRAs were leased through a competitive bidding process. Until the passage of the EAct of 2005, lands outside of KGRAs could be leased noncompetitively. Section 222 of the EAct of 2005 modified the Geothermal Steam Act of 1970 to allow only competitive lease sales for all Federal geothermal resources and their associated lands. The geothermal leasing regulations provide for four types of lands available for noncompetitive leasing: (1) Parcels of land that did not receive bids in a competitive sale; (2) Lands available exclusively for direct use; (3) Lands subject to mining claim and a current plan of operation; and (4) Lands for which a lease application was pending on August 8, 2005, if the applicant so chooses. Lease areas are nominated by the public for a lease sale.

When the BLM receives a nomination, it is adjudicated, and configured into lease parcels by the respective BLM state office. Lease parcels are then forwarded to the appropriate field office or FS regional office where the appropriate environmental analysis and review is conducted. This process is discussed in detail below.

The four stages of geothermal resource development within a lease are exploration, drilling operations, utilization, and reclamation and abandonment. Each stage requires a permit from the BLM. Leasing geothermal resources by the BLM vests with the lessee a non-exclusive right to future exploration and an exclusive right to produce and use the geothermal resources within the lease

area, subject to existing laws, regulations, formal orders, and the terms, conditions and stipulations in or attached to the lease form or included as conditions of approval to permits. Lease issuance alone does not authorize any ground-disturbing activities to explore for or develop geothermal resources without site specific approval for the intended operation. Such approval could include additional environmental reviews and permits. Also at each stage, the BLM, in consultation with the FS on NFS lands, can issue site-specific conditions-of-approval to protect resource values. The specific activities associated with each phase are detailed in Chapter 2.

A lease is issued for a primary term of 10 years and may be extended for two five-year periods. Each of these extensions is available provided the lessee meets the work commitment requirements or lessee made payment in lieu of minimum work requirements of each year. At any time a lease may receive a 5-year drilling extension. Once commercial production is established, the lease may receive a production extension of up to 35 years and a renewal period of up to 55 years. The lease must continue to produce to remain in effect. BLM may grant a suspension of operations and production on a lease when justified by the operator (see 43 CFR 3207).

Geothermal exploration and production on Federal land conducted through leases is subject to terms and stipulations to comply with all applicable Federal and state laws pertaining to various considerations for tribal interests, sanitation, water quality, wildlife, safety, cultural resources, and reclamation.

#### **1.5.4 Environmental Review Requirements for Lease Sales**

All geothermal decisions must be provided for and in conformance with the applicable land use plan. Prior to geothermal lease sales, individual BLM field offices must prepare Documentation of Plan Conformance and NEPA Adequacy (also termed DNAs) for parcels within their respective jurisdictions to determine: (1) whether the issuance of a particular lease is in conformance with the applicable land use plan; and (2) whether the BLM can properly rely upon existing NEPA documents that analyze the potential impacts of geothermal leasing (i.e., an environmental impact statement that accompanies a land use plan). Additionally, the BLM must also document completion of required government to government consultation with tribes and environmental reviews required to comply with other laws, including but not limited to the Endangered Species Act and National Historic Preservation Act.

While a DNA can provide NEPA compliance, it is not an “environmental document” per se, and cannot supply missing analysis; if the DNA evaluation shows a need for further analysis, a new or supplemental NEPA document would need to be prepared. Upon completion of the DNA, the BLM field office can make one of the following recommendations to the BLM State Office: (1) the parcel(s) be offered for sale; (2) the parcel(s) be offered for sale with slightly modified legal descriptions or additional lease sale notices and stipulations.

Stipulations could include areas identified for no surface occupancy (NSO), areas subject to controlled surface use (CSU), or areas subject to timing limitations; (3) that certain parcels not be offered for lease until additional NEPA and/or planning documentation is prepared; or (4) deny the lease due to lack of conformance with the existing land use plan. This PEIS seeks to amend appropriate land use plans to facilitate the leasing process.

On NFS lands, where the BLM leases the mineral estate, the FS forwards consent determinations to BLM as to which parcels should be offered for lease. The BLM cannot lease lands over the objection of the FS. The FS makes its consent decision after conducting a leasing analysis, including NEPA. This analysis determines if an area is administratively open to leasing and if so, what if any special stipulations are required. The proposed action identifies the lands open to leasing and those that are closed by statute, regulation, or order. The FS will conduct a separate process to determine if these lands are administratively open or closed. This subsequent leasing determination will be used to amend FS land use plans, as appropriate.

All National Park System lands are closed to geothermal leasing. If a lease parcel is near a National Park, the BLM and FS, in coordination with the National Park Service, must also determine if any subsequent development would likely impact a “significant thermal feature” within a unit of the National Park System. National Parks with such significant thermal features include, but are not limited to, the following areas: Mount Rainier National Park, Crater Lake National Park, Yellowstone National Park, John D. Rockefeller, Jr. Memorial Parkway, Bering Land Bridge National Preserve, Gates of the Arctic National Park and Preserve, Katmai National Park, Aniakchak National Monument and Preserve, Wrangell-St. Elias National Park and Preserve, Lake Clark National Park and Preserve, Lassen Volcanic National Park, Lake Mead National Recreation Area, Hot Springs National Park\*, Big Bend National Park (including that portion of the Rio Grande National Wild Scenic River within the boundaries of Big Bend National Park)\*, Hawai’i Volcanoes National Park\*, and Haleakala National Park\* (10 USC Section 1026[a]).

If the Secretary of the Interior determines that exploration, development, or utilization of the lease parcel is “reasonably likely to result in a significant adverse effect on a significant thermal feature within a unit of the National Park System,” then the lease would not be issued. If it is determined that use of the lease would be “reasonably likely to adversely affect” any significant thermal feature, then stipulations are included on leases and permits to protect the thermal features (10 USC Section 1026[c][d]).”

## **I.6 AREAS WITH GEOTHERMAL POTENTIAL**

In order to assess where geothermal development could occur, the BLM and FS, in partnership with the US DOE and US Geological Survey (USGS), conducted a detailed evaluation of the literature and state of the science to create a geothermal potential map of the planning area. The Notice of Intent (NOI) to prepare this PEIS (72 Fed Reg. 32679, June 13, 2007) noted that the PEIS would evaluate leasing on lands with moderate to high geothermal potential. Based on input from the public, industry, and other Federal, state, and local agencies, it was determined that the scope of the analysis needed to ensure that the geothermal potential area captures all opportunities for direct use, in addition to commercial electrical generation. It was also noted that the terms moderate and high potential were historically tied to use; however, as discussed earlier, there is a dynamic range of direct and indirect uses, and rapidly changing technology is lowering temperatures for electrical generation. Therefore, for the PEIS the geothermal potential area focuses on areas where there may be underground reservoirs of hot water or steam created by heat from the earth, or that have subsurface areas of dry hot rock. These areas are where the BLM and FS would likely receive geothermal lease nominations and applications in the near future.

### **I.6.1 Mapping Methods**

Primary data sources for assessing geothermal potential included scientific literature; government, academic, and industry sources; and other stakeholders who identified areas of interest during the public scoping process. The BLM and FS initially reviewed geothermal potential maps from various sources and identified the assessments most commonly accepted by government agencies involved in geothermal research and development and the geothermal industry. Some of the states have conducted extensive research into geothermal potential; this information was collected and incorporated. The status of geothermal resources by state is provided in Appendix A (State of the States).

The most recent and widely accepted maps were produced in 2005 by the Idaho National Engineering and Environmental Laboratory. The laboratory produced geothermal resource maps of 13 western states for the US DOE. The maps were developed by: 1) digitizing the geothermal maps of each state that were published by the National Oceanographic and Atmospheric Administration (NOAA) and the USGS in the 1980 to 1983 timeframe, also known as the Circular 790 maps; and 2) incorporating data from other sources, some of which were state-specific. In 2007, at the request of the BLM and FS, the Idaho National Engineering and Environmental Laboratory merged the state-specific maps into a single resource potential map for the 12-state PEIS project area. The laboratory also reevaluated the maps and made adjustments as appropriate where new data had become available.

This new map was then overlain with the following data sources that were considered indicators of geothermal potential, and then the potential area was expanded as necessary to include any such missing areas.

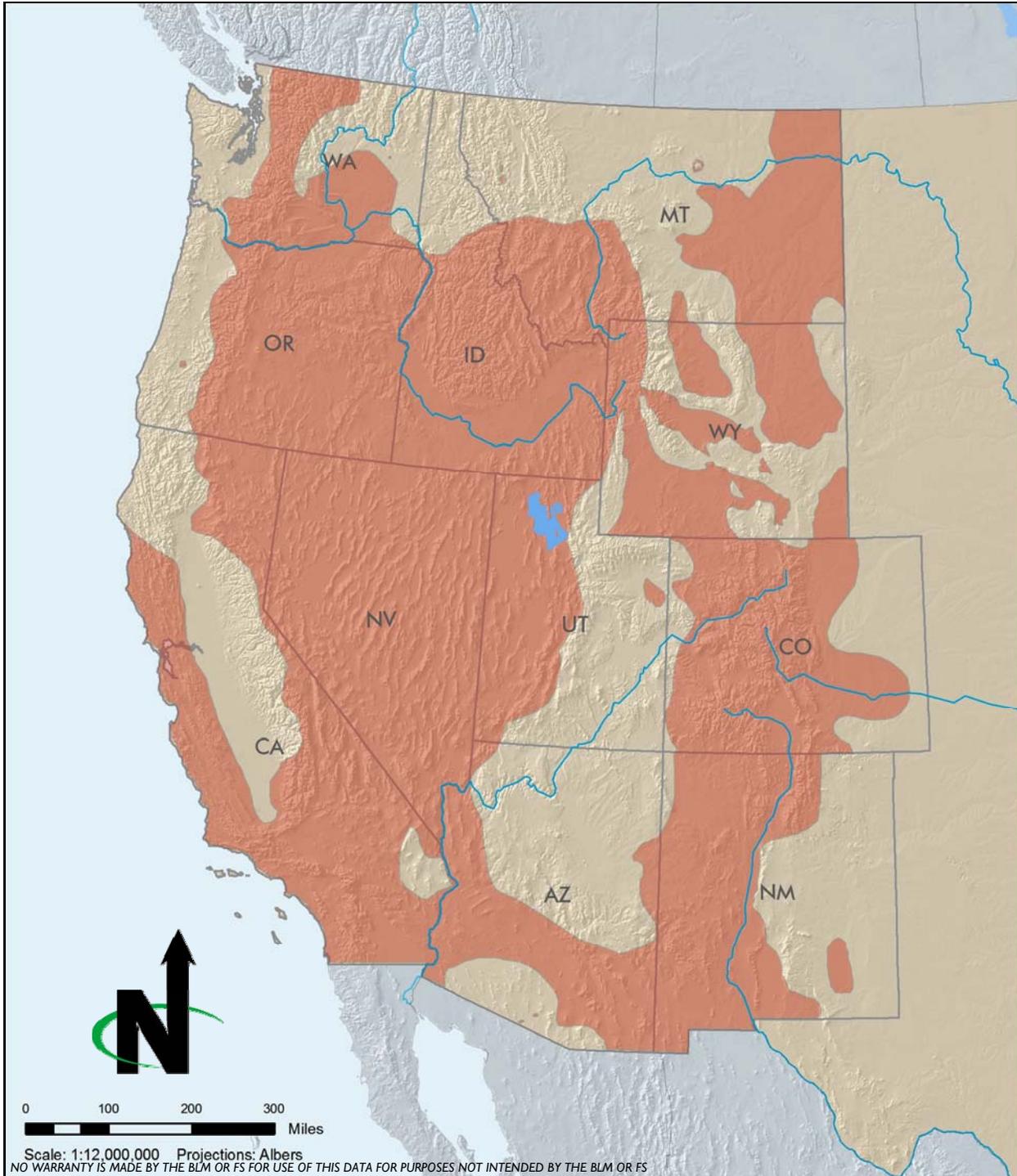
- Locations of operating geothermal facilities;
- Locations of issued leases and pending lease applications on BLM and FS lands;
- Maps provided by state agencies showing areas that they have identified as having geothermal potential, along with any other data on geology, water chemistry, and hydrogeology; and
- Areas identified during PEIS scoping comments from individuals, state agencies, and industry.

After inclusion of the above data sources, the BLM, FS, and US DOE identified further areas to be included that were known to have geothermal potential but had not appeared in any of the information sources listed above. The results were reviewed by subject experts within the BLM, FS, US DOE, USGS, and academia.

#### **1.6.2 Western US Geothermal Potential Areas**

In total, about 530 million acres in the 12 western states, including Alaska, are identified as having geothermal potential for indirect or direct applications (Figures 1-5, Areas of Geothermal Potential in the 11 Western States, and 1-6, Areas of Geothermal Potential in Alaska). The hottest resources and where commercial electrical generation would most likely occur, are generally within central and northern Nevada, western Utah, southern and central Idaho, southern and northeastern California, southeast Oregon, and along the Cascade mountain range. The reasonably foreseeable development scenario in Chapter 2 provides more specific details on the locations of where commercial electrical generation could likely occur.

Within the geothermal potential area, about 47 percent of the surface estate is administered by the BLM or FS. Approximately 143 million acres are on public lands within 103 BLM field offices and covered by over 130 BLM land use plans. There are approximately 104 million acres with geothermal potential on NFS lands within 68 National Forest units administered by 254 ranger districts. The acreage by BLM and FS administration by state is summarized in Table 1-1, BLM Public and NFS Lands Included in the Geothermal Potential Area. A detailed listing of the specific BLM Field Offices and National Forests, and their associated acres, is provided in Chapter 2.



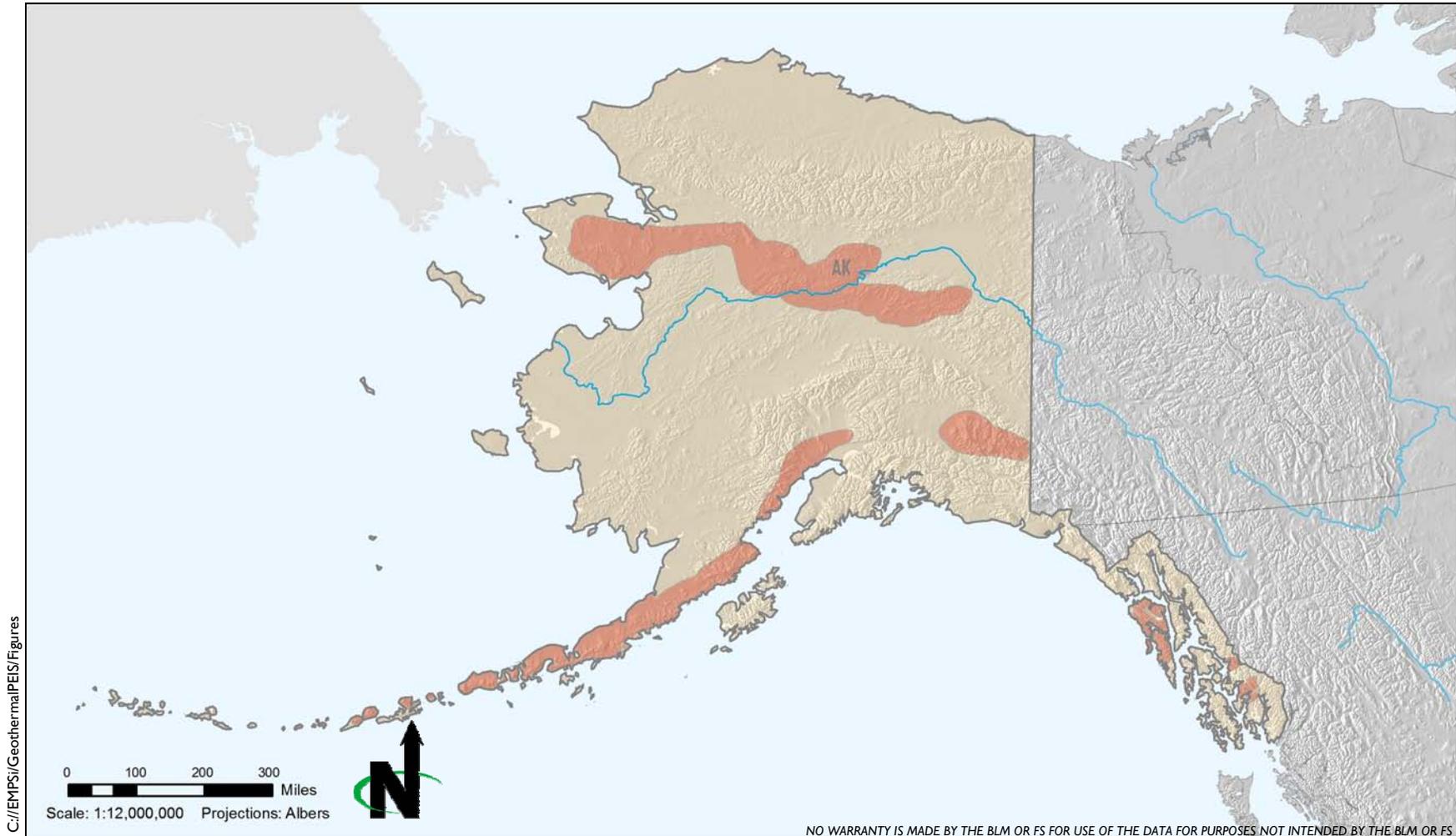
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Over 480 million acres in the 11 western states have geothermal potential.

**LEGEND:**  
 Geothermal potential area

## *Areas of Geothermal Potential in the 11 Western States*

**Figure I-5**



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About 50 million acres in Alaska have the potential for geothermal resources.

**LEGEND:**

Potential geothermal area

*Areas of Geothermal Potential in Alaska*

Figure I-6

**Table I-1  
BLM Public and NFS Lands Included in the  
Geothermal Potential Area**

<b>State</b>	<b>BLM Public Lands (Acres)</b>	<b>NFS Lands (Acres)<sup>1</sup></b>
Alaska	5,860,536	2,732,322
Arizona	8,842,090	2,166,912
California	13,969,825	13,467,992
Colorado	6,288,740	15,878,198
Idaho	12,716,814	17,767,599
Montana	3,438,730	8,370,307
Nevada	45,991,073	6,221,008
New Mexico	9,507,142	8,314,108
Oregon	14,025,425	14,746,444
Utah	10,766,598	3,056,933
Washington	-- <sup>3</sup>	6,430,898
Wyoming	11,747,232	4,429,442
<b>Total</b>	<b>143,154,205</b>	<b>103,582,163</b>

Source: BLM 2008a

<sup>1</sup> Calculations are based on FS ranger district acreage. Acreage is assigned to the state in which the ranger district's address is located, as many ranger districts cross state lines.

<sup>2</sup> Does not include Native or state selected lands.

<sup>3</sup> Acreage calculations for Oregon and Washington are combined because states share one single BLM state-level office.

## **I.7 BUREAU OF LAND MANAGEMENT AND FOREST SERVICE LAND PLANNING PROCESS**

The BLM administers approximately 258 million acres of public lands and 700 million acres of subsurface mineral estate in the US. This administrative responsibility must balance stewardship, conservation, and competing resource use, including the development of energy resources in an environmentally sound manner. Management of these public lands must be conducted in accordance with the requirements of the FLPMA and many other public laws. The FLPMA requires the BLM to develop land use plans, also called resource management plans (RMPs), to guide the management of the public lands it administers. An RMP typically covers public lands within a particular BLM field office. In order for geothermal leasing to occur on public lands, geothermal resource development must be allocated as an allowable use in the appropriate land use plan. If the plan does not include an allocation of some lands as open to geothermal leasing, or if the level of use (reasonably foreseeable development) for geothermal resources is absent or outdated, the land use plans for where such leasing would occur must be amended.

This PEIS is being developed to support the amendment of BLM land use plans covering those areas where leasing may eventually be proposed. An amendment

is initiated when a proposal changes the scope of resource uses or a change in the terms, conditions and decisions of an approved plan (43 CFR 1610.5-5). The Record of Decision (ROD) for this PEIS could amend 123 BLM land use plans as discussed in Chapter 2. Amendments would include allocating BLM-administered lands with geothermal resource potential as closed, open, or open with major or moderate constraints to geothermal leasing. This includes establishing a projected new level of potential geothermal development with existing planning level decisions (termed reasonably foreseeable development scenario), and identifying appropriate stipulations, best management practices, and procedures to protect other resource values and uses while providing sufficient pre-leasing analysis to enable the BLM to make future competitive geothermal leasing availability decisions.

The FS administers about 192 million acres of lands in the US. The FS administrative responsibility must address stewardship of the National Forest System (NFS) to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. Management of NFS lands must be conducted in accordance with the requirements of the National Forest Management Act of 1976 (16 USC 1600) and many other public laws. The FS administers its lands under land management plans, or forest plans, which are generally prepared for each National Forest. Forest plans provide the overall guidance (goals, objectives, standards, and management area direction) to achieve the desired future condition for the area being analyzed, and they contain specific management area prescriptions for each National Forest.

The FS uses the information in the Forest Plans in conducting leasing analysis for proposed geothermal leases. Under this analysis the FS determines if an area is administratively open for leasing and if it should be leased. If available for leasing, the analysis also evaluates if additional stipulations would be required to meet the goals and objectives of the Forest plan. This project will identify areas that are legally open to leasing; however, the FS will conduct a subsequent process to determine if these lands are administratively open. This subsequent leasing determination could be used to amend FS land use plans as appropriate. If the FS elects to amend a plan, the FS would follow its own procedures for any necessary NEPA compliance, which could include tiering to the PEIS. For pending lease applications on NFS lands included in this project (see Volume II), the FS would use this PEIS process to conduct leasing analyses and make final leasing consent decisions.

## **I.8 RENEWABLE ENERGY POLICIES**

### **I.8.1 Energy Policy Act of 2005**

The EPA Act of 2005 encourages the leasing and development of geothermal resources on Federal lands. Specifically, Section 225 requires that the Secretary of Interior and Secretary of Agriculture establish a program for reducing by 90

percent the backlog of geothermal lease applications that were pending as of January 1, 2005. The EPA Act of 2005 mandates that action be taken by August 8, 2010. As of January 1, 2005, there were 194 applications for geothermal leases pending on BLM and FS lands (Clarke 2006).

Section 211 of the EPA Act of 2005 provides a ten-year goal for the Secretary of the Interior to seek approval of non-hydropower renewable energy projects located on the public lands with a generation capacity of at least 10,000 megawatts of electricity, including electricity from geothermal resources. Section 223 gives the Secretary of the Interior authority to identify areas that could be leased exclusively for direct use of geothermal resources.

Section 222(d)(1) of the EPA Act of 2005 states that, "It shall be a priority for the Secretary [and the FS] to ensure timely completion of administrative actions, including amendments to applicable forest plans and RMPs, necessary to process applications for geothermal leasing pending on the date of enactment of this subsection." This section also contains the requirement that, "All future forest plans and RMPs for areas with high geothermal resource potential shall consider geothermal leasing and development."

Section 225 requires a memorandum of understanding between the BLM and the FS (completed April 14, 2006) that will, among other tasks:

- Establish a five-year program for geothermal leasing for National Forest System lands and a process for updating that program every five years; and
- Establish a program for reducing the backlog of geothermal lease applications pending as of January 1, 2005, by 90 percent (by August 8, 2010).

The memorandum of understanding was completed on April 14, 2006 and is provided in Appendix B (*Memorandum of Understanding: Implementation of Section 225 of the Energy Policy Act of 2005 Regarding Geothermal Leasing and Permitting*).

### **1.8.2 Executive Order 13212**

On May 18, 2001, the President signed Executive Order 13212, Actions to Expedite Energy-Related Projects, which states that, "the increased production and transmission of energy in a safe and environmentally sound manner is essential." Executive departments and agencies are directed to "take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy." Executive Order 13212 further states that: "For energy-related projects, agencies shall expedite their review of permits or take other actions as necessary to accelerate the completion of such projects, while maintaining

safety, public health, and environmental protections. The agencies shall take such actions to the extent permitted by law and regulation and where appropriate.” This PEIS addresses the leasing of geothermal resource for energy production. The BLM completed a PEIS for wind energy development on western lands in 2005, and an interagency team is preparing a PEIS for establishing corridors for energy transmission (including electrical lines and pipelines) (BLM 2005a; US DOE and BLM 2007).

### 1.8.3 Climate Change Policy

In 2002, the Federal government released the Global Climate Change Initiative and Policy Book that outlines a comprehensive plan to address climate change. The plan includes a goal to reduce the greenhouse gas intensity of the US economy by 18 percent over the ten-year period from 2002 to 2012 and to provide initiatives to reduce greenhouse gas emissions, including encouraging renewable energy resources development (US White House 2002). A study comparing greenhouse gas emissions from electrical generation using fossil fuels and geothermal fluids found that geothermal produces an order of magnitude less in carbon dioxide, hydrogen sulfide, methane, and ammonia. Table 1-2, Comparison of Geothermal and Fossil Fuel Carbon Dioxide Emissions for Electrical Generation, highlights the difference in emissions of carbon dioxide from these different energy sources. Direct use of geothermal resources, such as using geothermal to heat buildings, has the potential to displace 18 million barrels of oil per year (Western Governors’ Association 2006). Increased geothermal energy utilization could help the US reduce greenhouse gas emissions and meet policy goals (Bloomfield *et al.* 2003).

**Table 1-2**  
**Comparison of Geothermal and Fossil Fuel Carbon Dioxide Emissions**  
**for Electrical Generation**

	<b>Geothermal</b>	<b>Coal</b>	<b>Petroleum</b>	<b>Natural Gas</b>
Emissions (pounds carbon dioxide per kilowatt-hour)	0.20	2.095	1.969	1.321

Source: Bloomfield *et al.* 2003

On the state level, many states have passed renewable portfolio standards, which require electric utility providers to obtain a minimum percentage of their energy from renewable generation sources (including geothermal, wind, solar, hydroelectric, and other renewables such as biomass and tidal). Geothermal development has the potential to make significant contributions to meeting renewable portfolio standards, especially given that it provides reliable and consistent base power, unlike solar or wind. A summary of states that have legislative renewable portfolio standards is provided in Table I-3, State Renewable Portfolio Standards (as of April 2008).

In 2005, the Western Governors' Association established the Clean and Diversified Energy Initiative, which included forming the Geothermal Task Force. The Task Force issued a detailed report on geothermal potential and constraints and a strategy for improving geothermal development. A key recommendation of the report was a call for initiatives to facilitate the timely leasing and permitting of geothermal resources (Western Governors' Association 2006).

#### **What is a renewable portfolio standard?**

The renewable portfolio standard is a legal requirement that obligates each retail seller of electricity to include in its resource portfolio (the resources procured by the retail seller to supply its retail customers) a certain amount of electricity from renewable energy resources, such as wind, solar and geothermal energy. The retailer can satisfy this obligation by either:

- (1) Owning a renewable energy facility and producing its own power; or
- (2) Purchasing renewable electricity from someone else's facility.

Renewable portfolio standard policies are implemented at the state level and vary considerably in their requirements with respect to their time frame, resource eligibility, treatment of existing plants, arrangements for enforcement and penalties, and whether they allow trading of renewable energy credits.

Using a renewable portfolio standard has recently become one of the most popular ways to encourage greater use of renewable energy. A renewable portfolio standard is an efficient method of meeting policy targets for greater use of renewable energy, and can be implemented in both regulated and restructured markets.

Source: US Department of Energy 2007

**Table I-3**  
**Western States Renewable Portfolio Standards (as of April 2008)**

<b>State</b>	<b>Amount<sup>1</sup></b>	<b>Year<sup>2</sup></b>	<b>Organization Administering Renewable Portfolio Standards</b>
Arizona	15%	2025	Arizona Corporation Commission
California	20%	2010	California Energy Commission
Colorado	20%	2020	Colorado Public Utilities Commission
Montana	15%	2015	Montana Public Service Commission
New Mexico	20%	2020	New Mexico Public Regulation Commission
Nevada	20%	2015	Public Utilities Commission of Nevada
Oregon	25%	2025	Oregon Energy Office
Washington	15%	2020	Washington Secretary of State

<sup>1</sup> Percentages refer to a portion of electricity sales and megawatts to absolute capacity requirements.

<sup>2</sup> Most of these standards phase in over years, and the date refers to when the full requirement takes effect.

Source: US DOE 2007c

## I.9 SCOPE OF ANALYSIS

As previously stated, Section 225 of the EAct of 2005 requires that the US DOI and USDA Forest Service reduce the backlog of geothermal lease applications pending as of January 1, 2005, by 90 percent (by August 8, 2010). Section 222(d) dictates that it be a priority for the BLM and the FS to ensure timely completion of actions such as amendments to FS plans and RMPs necessary to process lease applications pending on August 8, 2005, and that all future forest plans and RMPs in areas of geothermal resource potential consider geothermal leasing and development. To respond to these directives and the stated need for action, the PEIS incorporates two different scopes for analysis. The first scope covers the programmatic analysis to allocate lands as available for leasing and development of geothermal resources and apply stipulations. The second scope covers the site-specific analysis of the backlogged lease application areas.

### I.9.1 Programmatic Scope

For the programmatic analysis, the “project area” is defined as the western US (Alaska, Arizona, California, Colorado, Idaho, Nevada, New Mexico, Montana, Oregon, Utah, Washington, and Wyoming). The “planning area” for which planning level decisions would be made, is the defined area of geothermal potential (see Section 1.6.2 Western US Potential Areas). The planning area includes BLM- and FS-administered surface lands with minerals under Federal ownership that have geothermal potential and the subsurface Federal geothermal mineral estate on other lands. Surface lands administered by other Federal agencies, such as the National Park Service and US DOI, Fish and Wildlife Service (USFWS), and state agencies are not assessed in this document unless their administrative boundaries overlap with public or NFS lands. If these lands have subsurface Federal geothermal mineral estate, the BLM would apply

**Project Area:** The 12 western states, including Alaska.

**Planning Area:** Lands with geothermal potential in the 12 western states.

the management direction provided in this PEIS, with the surface management agency's consent, for lease nominations or applications.

Lands that are not administered by the BLM or FS, or that are closed to geothermal leasing by statute, are not part of the analysis. These include lands contained within a unit of the National Park System, or that are otherwise administered by the National Park Service; fish hatcheries or wildlife management areas administered by the Secretary; State fish and wildlife refuges and state parks; and Indian trust or restricted lands within or outside the boundaries of Indian reservations (43 CFR 3201.11).

This PEIS is a programmatic document that analyzes the broad impacts associated with allocation of geothermal resources for leasing along with the adoption of stipulations and best management practices. As such, it meets the intent of the implementing regulations for the NEPA, which state, "Agencies shall prepare statements on broad actions so that they are relevant to policy and are timed to coincide with meaningful points in the agency planning and decisionmaking" (40 CFR 1502.4). The PEIS does not evaluate site-specific issues associated with geothermal exploration, drilling, utilization, or reclamation and abandonment. A variety of location-specific factors (e.g., soil type, watershed, habitat, vegetation, viewshed, public sentiment, the presence of threatened and endangered species, and the presence of cultural resources) varies considerably from site to site, especially over the 12-state project area. The PEIS analyzes a reasonably foreseeable development scenario to assess the likely impacts from development following leasing in the planning area. The PEIS will provide the necessary information to support the amendment of land use plans covering those lands where leasing may eventually be proposed (see Section 1.7 – BLM and FS Land Planning Process). The PEIS also provides analysis to allow the FS to more efficiently provide subsequent consent decisions for leasing actions on NFS lands.

Site-specific impacts for subsequent geothermal exploration, drilling, utilization, or reclamation and abandonment would be assessed during the permitting process and in separate NEPA documents prepared by local BLM and FS offices. Such analysis could tier to this document in accordance with NEPA implementation regulations (40 CFR 1502.20).

### **1.9.2 Scope of Environmental Analysis of Pending Lease Applications**

In addition to the programmatic analysis, this PEIS also provides site-specific analysis to inform leasing decisions to be made on 19 pending lease applications located in seven geographical clusters on public and NFS lands. This supplemental analysis is provided in Volume II and is delineated by individual chapters for each geographical cluster. The project and planning areas are specific to the analysis region and are defined in their respective chapters. The analysis focuses on relevant issues and resource concerns in those planning area.

If resources are not expected to be impacted, they are not included in the analysis. The leasing analysis tiers to the programmatic analysis, as appropriate.

### **1.9.3 Scope of Geographic Information System Data and Graphics**

Data from geographic information systems (GIS) have been used in developing acreage calculations and for generating many of the figures. Calculations in the PEIS are rounded and dependent upon the quality and availability of data. Data was collected from a variety of sources including the BLM and FS, and other planning efforts. Given the scale of the programmatic analysis, the compatibility constraints between datasets, and lack of data for some resources, all calculations are approximate and serve for comparison and analytic purposes only. Likewise, the figures are provided for illustrative purposes and subject to the limitations discussed above. Detailed information is available from local BLM and FS offices. Since the publication of the Draft PEIS, additional GIS data were received, including updated land administrative boundaries and the digitizing of the Island Park Geothermal Area. The acres in the Final PEIS have been recalculated and revised accordingly.

## **1.10 PLANNING CRITERIA**

In accordance with BLM planning regulations (43 CFR 1610.4-2), planning criteria were developed to help guide data collection, alternative formulation, and impact analysis. Criteria are generally based on laws, regulations, and agency guidance and serve as side-boards to keep the planning process focused.

1. The PEIS will be completed in compliance with the Federal Land Policy and Management Act, the Endangered Species Act, the Clean Water Act, the Clean Air Act, the National Environmental Policy Act and all other applicable laws, Executive Orders and management policies of the BLM.
2. The PEIS will provide the analytical basis for decisions to amend the appropriate individual land use plans as necessary to respond to the potential for increased levels of leasing and development of geothermal resources on BLM-administered lands. Lands open, closed, and open with restrictive stipulations to geothermal leasing will be identified in the affected plans.
3. The PEIS will be limited to addressing leasing and development of geothermal resources, and will not address management of other resources, although the BLM will consider and analyze the impacts on other managed resource values of this increased use. Management of other resources in the planning areas affected will continue to be governed by the applicable RMPs.
4. The RMPs, as amended, will recognize valid existing rights.

5. BLM will coordinate with local, State, Tribal and Federal agencies in the PEIS to strive for consistency with their existing plans and policies, to the extent practicable.
6. BLM will coordinate with Tribal governments and will provide strategies for the protection of recognized traditional uses in the PEIS process.
7. BLM will take into account appropriate protection and management of cultural and historic resources in the PEIS process, and will engage in all required consultation.
8. BLM will recognize in the PEIS the specific niche occupied by public lands in the life of the communities that surround them and in the nation as a whole.
9. BLM will make every effort to encourage public participation throughout the process.
10. BLM has the authority to address lands with wilderness characteristics and describe protective management prescriptions in RMPs. In keeping with the public involvement process that is part of all land use planning efforts, the BLM will consider public input regarding lands to be managed to maintain wilderness characteristics.
11. Environmental protection and energy production are both desirable and necessary objectives of sound land management practices and are not to be considered mutually exclusive priorities.
12. The PEIS will consider and analyze climate change impacts in its land use plans and associated NEPA documents, including the anticipated climate change benefits of geothermal energy.
13. The PEIS will comply with the Geothermal Steam Act, as amended, and the legislative directives set forth in the Energy Policy Act of 2005.
14. Geospatial data will be automated within a GIS to facilitate discussions of the affected environment, formulation of alternatives, analysis of environmental consequences, and display of results.

## **I.11 DECISIONS TO BE MADE**

As discussed above, the PEIS contains two distinct scopes, one for the programmatic analysis and one for the pending lease applications. Separate decisions will be made for each scope.

### **I.11.1 Decisions on the Programmatic Analysis**

No sooner than 30 days after the US Environmental Protection Agency (EPA) publishes the Notice of Availability of the Final EIS, the BLM and FS will issue a Record of Decision on the findings of the programmatic analysis. The Record of Decision will include:

- An explanation of the decision, including a discussion of the factors that influenced the decision;
- A summary of the alternatives considered;
- Identification of the environmentally preferable alternative;
- A list of BLM RMPs that would be amended by the action; and
- Documentation of stipulations, best management practices, and procedures that would be adopted for leasing actions or imposed at the development stage.

### ***BLM Decisions Resulting from this PEIS***

The signing of the Record of Decision would amend all affected BLM land use plans as discussed in Section 1.7 – BLM and FS Land Planning Process. Amendments would include allocating BLM-administered lands with geothermal resource potential as closed, open, or open with major or moderate constraints to geothermal leasing. This includes establishing a projected new level of potential geothermal development with existing planning level decisions (termed reasonably foreseeable development scenario), and identifying appropriate stipulations, best management practices, and procedures to protect other resource values and uses while providing sufficient pre-leasing analysis to enable the BLM to make future competitive geothermal leasing availability decisions.

Once the plans are amended, the BLM can make decisions whether or not to issue geothermal leases in conformance with the amended land use plan on the basis of this PEIS. Following this amendment process, it is the intent of the BLM that, upon receipt of future nominations or applications for direct use, affected BLM offices would be able to conduct a DNA evaluation to make lease sale decisions without further plan amendments or NEPA analysis, unless special circumstances require additional environmental evaluation. The BLM and FS would conduct other environmental reviews to comply with other laws, including but not limited to the Endangered Species Act and National Historic Preservation Act, prior to issuing leases (see Section 2.2.2 Lease Stipulations, Best Management Practices, and Procedures).

### ***FS Decisions Resulting from this PEIS***

For the FS, this PEIS would identify those lands that are legally open or closed to consideration for geothermal leasing on affected NFS lands, along with any terms and conditions. The FS would be able to tier from the PEIS to facilitate future leasing analysis and any allocation or stipulation decisions. For any leasing on NFS lands beyond the specific pending lease applications discussed in Volume II, the FS would still need to provide consent. Prior to providing consent to the BLM the FS generally must identify specific lands that are administratively available for leasing of geothermal resources and under what conditions. In order to make the administrative availability decision the FS generally must

prepare an additional NEPA document (leasing analysis). The FS is not proposing to amend any land use plans as part of the proposed action.

Implementation of the proposed action would minimize the delays that currently occur for geothermal leasing, ensure consistency in the leasing process, provide a programmatic basis for future lease-specific consent decisions to leasing on NFS lands, reduce costs, and provide opportunities to tier future site-specific NEPA analyses from the Final PEIS.

***BLM Decisions to be Made Following Subsequent NEPA Analysis***

Although the BLM expects to be able to rely upon this analysis, combined with DNA evaluations to document NEPA adequacy, to make lease issuance decisions in the near term, the issuance of a lease does not give the lessee the right to proceed with exploration or development (i.e., any surface disturbing activities beyond casual use) in the absence of further site-specific permits with associated environmental analysis. This document does predict a general level of anticipated future geothermal development in BLM areas that have geothermal potential, but it is not intended to provide full analysis of all phases of development. There are several stages of decision making necessary to approve geothermal resource development, each with its own environmental compliance requirements, and this document covers only the land use planning and lease issuance stages.

***Forest Service Decisions to be Made Following Subsequent NEPA Analysis***

This programmatic analysis does not identify lands for which the FS would or would not consent to the issuance of geothermal leases, with the exception of the pending lease application areas discussed in Volume II. It also does not amend NFS land use plans as may be necessary when the FS decides to consent to the issuance of a geothermal lease for a particular area of land. This PEIS does provide enough analysis to predict likely areas where major and minor stipulations or protective constraints on surface use would be needed, which would facilitate the subsequent NEPA process that would be necessary to provide future leasing consent decisions. Approval of permits allowing any surface disturbing activity generally would be issued following additional site-specific analysis completed after issuance of a geothermal lease.

**I.11.2 Decisions on Pending Lease Applications**

The BLM and FS will issue separate decisions for each of the seven areas associated with the pending lease applications. This will require execution of Records of Decision separate from the programmatic action. The decision maker for the pending application areas will be the field office manager or forest supervisor, so it is likely that multiple Records of Decision could be signed (e.g., one decision for each of the seven geographical clusters with leasing applications). The decisions may be issued all at once or may be independently released as issues are addressed and other compliance actions are completed (e.g., tribal consultation).

These decision documents are each supported by a narrower and more specific scope of analysis than that which can be provided at the programmatic level for the broader areas of geothermal potential. This analysis is intended to be sufficient to allow BLM and FS managers to determine areas legally and administratively open or closed, and any necessary stipulations or other terms and conditions to protect other resource values that should be attached to leases in the event that the decisions do allow leases to be issued for the pending applications.

The analysis for these seven pending application areas will provide FS leasing analysis, and provide the basis for FS consent decisions related to each individual application covered in this PEIS. The BLM will be able to decide whether or not to issue leases for each of the pending applications, on both NFS and BLM lands, following this PEIS and the associated Record(s) of Decision.

### **1.11.3 Future Stages of Decision Making and NEPA Analysis for Pending Lease Application Areas**

As stated above, the issuance of a lease on pending applications (on either FS or BLM administered lands) does not give the lessee the right to proceed with exploration or development in the absence of further site-specific permits with associated environmental analysis. This document does predict a general level of anticipated future geothermal development in areas that have geothermal potential, but it is not intended to provide full analysis of all phases of development. There are several stages of decision making necessary to approve geothermal resource development, each with its own environmental compliance requirements, and this document covers only the land use planning and lease issuance stages.

## **1.12 PUBLIC INVOLVEMENT**

### **1.12.1 Scoping Process and Public Review of the Draft PEIS**

The NEPA requires an early and open process for determining issues that should be addressed and analyzed in the PEIS to help decision makers implement the proposed action or an alternative. To formally solicit public input, the public scoping period began with the publication of the NOI in the *Federal Register* on June 13, 2007, and continued through August 13, 2007. A project website was launched prior to the beginning of the scoping period and was maintained and expanded throughout scoping. Soon after the scoping period began, project newsletters were mailed to the project mailing list of approximately 1,600 individuals. Public scoping meetings, hosted by the BLM and FS, were held throughout July 2007 in ten cities across the western US, including Alaska. These meetings provided opportunities for the public, local government, tribes, utilities, and other interest groups to learn about the PEIS, to provide input into the development of the PEIS, and to voice their concerns related to potential environmental impacts that should be addressed in the PEIS. Approximately 174 individuals attended the scoping meetings.

The comments received and evaluated during the scoping period were considered in formulating the alternatives and conducting initial impact evaluations. One hundred and one (101) verbal comments were cataloged. Also, 79 written comment submittals were received as comment cards and letters (received by US Mail), email, and facsimile. Public comments received during the scoping period were related to the NEPA process, purpose and need, alternatives, impact analysis, and project coordination. Some comments addressed issues pertinent to geothermal development but were outside the scope of the PEIS. Table I-4, Summary of the PEIS Public Scoping Comments, summarizes the general themes from the public comments.

Issue identification was used in the PEIS process to develop alternatives and to focus the analysis. A planning issue is a concern regarding management of resources or uses on the public lands that can be addressed in a variety of ways. Based on the analysis of public scoping comments, three planning issues were identified: (1) How will the values and unique resources within special management areas be protected? (2) What actions or restrictions will be needed to avoid or minimize impacts natural resources and to wildlife and their habitat, including sagebrush-obligate species and old growth forest species? (3) How will geothermal leasing and any subsequent development protect and conserve cultural resources?

On June 20, 2008 the Notice of Availability of the Draft PEIS was published in the *Federal Register*. The NOA initiated the 90-day public comment period. The BLM and FS conducted 13 public meetings during July 2008 in the 12 western states to solicit comments. Over 70 organizations, government agencies, industry representatives, and individuals provided unique letters during the comment period. Most of the written submissions contained multiple comments on different topics, and over 500 unique comments were made. In addition, two form letters were submitted. Chapter 6 provides a detailed review of the public comments on the Draft PEIS.

#### **1.12.2 Consultation and Coordination with Tribes**

The BLM and FS are consulting with federally recognized Native American Indian Tribes in accordance with Section 106 of the National Historic Preservation Act and Executive Order 13175, Consultation and Coordination with Indian Tribal Governments. Letters were mailed in September 2007 to each tribal executive official of over 400 tribes and pueblos in the western US and Alaska from the Deputy Director of the BLM and Deputy Chief of the Forest Service (see Chapter 6 for the distribution list). The letters documented the PEIS process and detailed the pending lease applications that are being assessed in the PEIS, and invited them to participate in the consultation process. Seven tribes provided a response letter. One letter noted that no lease applications were in their area of interest, four letters requested consultation if any lease applications would fall in their areas of interest, and two letters requested consultation and to help participate in the PEIS process. The consultation process will be ongoing throughout the project.

**Table I-4  
Summary of the PEIS Public Scoping Comments**

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**Comments Related to the NEPA Process**

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The BLM and FS should ensure the PEIS conforms to all requirements of NEPA.

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The PEIS should adequately address the cumulative impacts of proposed and future geothermal projects, as well as the need for associated infrastructure.

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The PEIS should be used as tiering document for subsequent, area-specific and site-specific development.

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**Comments on the Purpose and Need**

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The PEIS should address how the project will satisfy the requirements of policy and regulations such as the Energy Policy Act of 2005.

---

The PEIS should clarify the geographic scope of the project, including the process used to designate potential lease areas and areas that will be excluded from leasing analysis.

---

The PEIS should clearly define the extent to which the PEIS will cover tribal lands.

---

How will the PEIS address individual backlogged leases?

---

How will the PEIS define and address future technologies?

---

Some comments identified specific areas as potential lease areas or areas that should be excluded.

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**Comments on Alternatives**

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Alternatives should include the exclusion of sensitive areas, such as special designated lands, including Areas of Critical Environmental Concern, wilderness, and wild and scenic rivers.

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Lands surrounding Yellowstone National Park should be excluded.

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Leasing should only be allowed near existing infrastructure and transmission lines.

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**Comments on Impact Analysis**

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The PEIS should analyze all potential impacts related to geothermal exploration and development. The most common concerns were effects to wildlife, wildlife habitat, groundwater, and aesthetics.

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**Comments on Coordination and Consultation**

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Appropriate Federal and state agencies should be included in and consulted throughout the geothermal PEIS process.

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Tribal governments should be involved throughout the process.

---

How will the PEIS identify areas of high potential without divulging valuable proprietary information of potential developers who have already identified resources within the areas?

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The scoping period should be extended and additional scoping meeting locations should be added to allow full scoping opportunities.

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**Comments Outside the Scope of the PEIS**

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The PEIS should be a joint NEPA/California Environmental Quality Act document and should identify the California Environmental Quality Act lead agency.

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The PEIS should assess impacts from development on tribal lands.

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The PEIS should include provisions that detail the necessary enforcement to ensure that reclamation is effectively completed after exploration activities. Agencies should also be obligated to research and disclose the environmental and legal track record of potential geothermal leaseholders.

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## **I.13 RELATIONSHIP TO BUREAU OF LAND MANAGEMENT AND FOREST SERVICE POLICIES, PLANS, AND PROGRAMS**

The leasing of geothermal resources is subject to a number of Federal, state, and local laws, regulations, and plans. The following section summarizes the most pertinent Federal and state policies, plans, and laws that affect this PEIS.

### **I.13.1 Federal Land Policy and Management Act of 1976**

The FLPMA mandates that multiple use and sustained yield principles govern the management of public lands. The concept of multiple use directs the BLM to manage public lands to best meet the present and future needs of the American people. The FLPMA (Section 103) defines multiple use as “a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources,” and sustained yield as “the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple use.”

As a result of this PEIS, the BLM will amend land use plans to adopt allocations, stipulations, and best management practices to allow for geothermal leasing.

### **I.13.2 National Forest Management Act of 1976**

The National Forest Management Act (NFMA) is the primary statute governing the administration of national forests. The Act expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The National Forest Management Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. In doing so, the Secretary must: use an interdisciplinary approach; coordinate with state and local resource management efforts; provide for public participation; and provide for multiple-use and sustained-yield of products and services. The Secretary must revise the management plans whenever significant changes occur in a unit. Each National Forest will use information in the PEIS to determine if its specific resource plan needs to be amended to incorporate geothermal leasing.

### **I.13.3 National Environmental Policy Act**

The NEPA supports a national policy that requires Federal agencies to review the effects of their actions on the quality of the human environment. The review process ensures that the environmental impacts of any Federal or federally funded action is available to public officials and citizens before decisions are made and before actions are taken.

### **I.13.4 Clean Air Act**

The Clean Air Act was passed to regulate air pollution and improve air quality. It regulates air emissions from area, stationary, and mobile sources. This law

also authorizes the US EPA to establish National Ambient Air Quality Standards to protect public health and the environment.

**1.13.5 Clean Water Act**

The Clean Water Act established the basic structure for regulating discharges of pollutants into waters of the US. Also included are requirements to set water quality standards for all contaminants in surface waters. The Clean Water Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit was obtained under its provision.

**1.13.6 Mining and Mineral Policy Act of 1970**

Section 2 of the Mining and Mineral Policy Act of 1970 encourages the development of mineral resources, including geothermal resources, on Federal lands.

**1.13.7 Geothermal Steam Act of 1970**

The Geothermal Steam Act of 1970, as amended, governs the leasing of geothermal steam and related resources on Federal lands. This Act authorizes the Secretary of the Interior to issue leases for development of geothermal resources and also prohibits leasing on a variety of public lands, such as those administered by USFWS.

**1.13.8 Energy Policy Act of 2005**

The EPA Act of 2005 was intended to establish a comprehensive, long-range domestic energy policy. It provides incentives for traditional energy production as well as newer, more-efficient energy technologies and conservation. It contains several provisions related to geothermal energy to make it more competitive with traditional methods of energy production.

**1.13.9 Endangered Species Act**

The Endangered Species Act provides for the Federal protection of threatened plants, insects, fish, and wildlife. The USFWS and the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) administer the Endangered Species Act on behalf of the US. The major components of the Endangered Species Act include:

- Provisions for the listing of threatened and endangered species;
- The requirement for consultation with USFWS and NOAA Fisheries on Federal projects, under certain circumstances;
- Prohibitions against the taking of listed species; and
- Provisions for permits to allow the incidental taking of listed species.

**1.13.10 The Migratory Bird Treaty Act of 1918, as Amended**

The Migratory Bird Treaty Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. Executive Order 13186, signed January 10, 2001, sets forth the responsibilities of Federal agencies to further implement the provisions of the Migratory Bird Treaty Act by integrating bird conservation principles and practices into agency activities by ensuring that Federal actions evaluate the effects of actions and agency plans on migratory birds.

**1.13.11 The Wild Free-Roaming Horse and Burro Act of 1971, as Amended by the Public Rangelands Improvement Act of 1978**

This Act provides for the management, protection, and control of wild horses and burros on public lands and authorizes the adoption of wild horses and burros by private individuals.

**1.13.12 The Fish and Wildlife Conservation Act of 1980**

The Fish and Wildlife Conservation Act of 1980 encourages Federal agencies to conserve and promote the conservation of nongame fish and wildlife species and their habitats.

**1.13.13 The Taylor Grazing Act of 1934**

The Taylor Grazing Act of 1934 introduced Federal protection and management of public lands by regulating grazing on public lands.

**1.13.14 The Public Rangelands Improvement Act of 1978**

The Public Rangelands Improvement Act of 1978 requires the BLM to manage, maintain, and improve the condition of the public rangelands so that they become as productive as feasible.

**1.13.15 National Historic Preservation Act of 1966, as Amended**

The National Historic Preservation Act of 1966 provides for the establishment of the National Register of Historic Places (NRHP) to include historic properties such as districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, and culture. Section 106 of the Act requires Federal agencies with jurisdiction over a proposed Federal project to take into account the effect of the undertaking on cultural resources listed or eligible for listing on the NRHP, and afford the State Historic Preservation Offices and the Advisory Council on Historic Preservation an opportunity to comment regarding the undertaking. The NRHP eligibility criteria have been defined by the Secretary of the Interior's Standards for Evaluation (36 CFR 60).

**1.13.16 Alaska National Interest Lands Conservation Act**

The Alaska National Interest Lands Conservation Act (ANILCA) was passed in 1980 designating 104 million acres for conservation by establishing or expanding national parks, wildlife refuges, wild and scenic rivers, wilderness areas, forest

monuments, conservation areas, recreation areas, and wilderness study areas to preserve them for future generations. Section 810(a) of the ANILCA requires that an evaluation of subsistence uses and needs be completed for any Federal determination to “withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands.”

#### **1.13.17 Alaska Native Claims Settlement Act**

The Alaska Native Claims Settlement Act (ANCSA) was passed by Congress in 1971 to settle aboriginal land claims in Alaska. Under the settlement the Natives received title to a total of over 44 million acres, to be divided among some 220 Native Villages and 12 Regional Corporations established by the act.

### **1.14 OTHER PLANS AND PROGRAMS**

The following plans and programs also apply to geothermal leasing.

#### **1.14.1 State Renewable Portfolio Standard Program**

Renewable portfolio standards are state laws requiring electric utility providers to obtain a minimum percentage of their energy from renewable generation sources. These renewable resources include geothermal, wind, solar, hydroelectric, and other renewables such as biomass and tidal. Eight of the twelve states considered in this PEIS have renewable portfolio standard policies in place (Table I-3, State Renewable Portfolio Standards). Alaska, Idaho, Utah, and Wyoming do not have renewable portfolio standards in place.

#### **1.14.2 State Greenhouse Gas Reductions Laws**

Greenhouse gas reduction laws have been passed in several states in response to the potential threat of climate change. The laws set greenhouse gas reduction goals at future milestones and work in conjunction with state renewable portfolio standards. Greenhouse gas reduction laws work indirectly as an incentive in renewable energy development.

#### **1.14.3 West-wide Energy Corridor Programmatic Environmental Impact Statement**

The US DOE, BLM, FS, and US Department of Defense are preparing a PEIS to evaluate issues associated with the designation of energy corridors on Federal lands in 11 western states (US DOE and BLM 2007). Based on the information and analyses developed in this PEIS, each agency would amend its respective land use plans by designating a series of energy corridors. The proposed transmission corridors could provide transmission services to potential geothermal power plants located on public lands addressed for leasing in this PEIS.

### **1.15 READERS GUIDE TO THE PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT**

The Programmatic EIS is divided into three volumes. Volume I provides the programmatic environmental impact statement, Volume II provides the supplemental environmental analysis for the pending geothermal lease applications, and Volume III includes the appendices.