ASEK1

Implementation Plan
for the
Hawaii Geothermal Project
Environmental Impact Statement

Prepared by
The United States Department of Energy
Office of Energy Efficiency and Renewable Energy
Washington, D.C.

In Cooperation with
County of Hawaii
County of Maui
National Marine Fisheries Service
National Park Service
State of Hawaii
United States Army Corps of Engineers
United States Fish and Wildlife Service
United States Geological Survey

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PREFACE

The Hawaii Geothermal Project (HGP) has been proposed by the State of Hawaii as part of a strategy for developing an indigenous, non-fossil power resource in the State. It has been determined that the HGP is subject to the National Environmental Policy Act of 1969 (NEPA). An environmental impact statement (EIS) (DOE/EIS-0187) is being prepared by the U.S. Department of Energy (DOE) to identify and assess the environmental consequences of the HGP.

This Implementation Plan (IP) is a DOE public disclosure document, prepared preceeding issuance of a draft EIS, for recording the results of the scoping process and providing guidance to DOE for preparation of the HGP Draft EIS. The IP includes a statement of the planned scope and content of the EIS; the purpose and need for the proposed action; a description of the scoping process and the results, including a summary of comments received and their disposition; target schedules; anticipated consultation with other agencies; and disclosure statements executed by contractors and subcontractors assisting DOE in the preparation of the EIS. The IP is a "living document" in that it may be revised as needed throughout the preparation of the EIS to provide updated information regarding major changes in scope, methodology, or work plan.

As a public disclosure document, the IP and any formal revisions are available to the public for information. Copies of the HGP IP are available upon written request. Copies will be filed in 25 DOE public reading rooms and circulated among agencies and organizations on the HGP EIS mailing list. This IP has received an internal review by DOE and by cooperating agencies that are participating in the preparation of the EIS.

Questions about the IP or HGP and written requests for copies of the IP may be directed to:

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General information on the procedures followed by DOE in complying with NEPA may be obtained from:

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Implementation Plan for the Hawaii Geothermal Project Environmental Impact Statement

1. INTRODUCTION

The U.S. Department of Energy (DOE)* is preparing an Environmental Impact Statement (EIS) (DOE/EIS-0187) that identifies and evaluates the environmental impacts associated with Phases 3 and 4 of the proposed Hawaii Geothermal Project (HGP), as defined by the State of Hawaii in its 1990 proposal to Congress (DBED 1990), and reasonable alternatives to the HGP. The EIS is being prepared pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA), as implemented by the President's Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) and the DOE NEPA Implementing Procedures (10 CFR Part 1021), effective May 26, 1992. It will provide a basis for incorporating environmental factors into DOE's decision of whether to partially fund Phase 3 of the HGP. The funding of Phase 4 is currently uncertain, and development activities could proceed independently of DOE's actions. The EIS will provide a body of facts and analyses that will be used to support final decisions for Phases 3 and 4 of the HGP.

Originally, the State's proposal for the HGP (the location of the proposed project is shown in Figure 1.1) consisted of four phases: (1) exploration and testing of the geothermal resource beneath the slopes of the active Kilauea volcano on the Island of Hawaii (the Big Island), (2) demonstration of deep-water power cable technology in the Alenuihaha Channel between the Big Island and Maui, (3) verification and characterization of the geothermal resource on the Big Island, and (4) construction and operation of commercial geothermal power production facilities on the Big Island, with overland and submarine transmission of electricity from the Big Island to Oahu and possibly other islands (DBED 1990). From 1985 through 1989, the State had envisioned a large-scale 500-MW(e) geothermal/inter-island submarine cable project as an alternative to the State's 90-percent dependence on imported oil for electricity generation. However, as of January 1990, the State of Hawaii has redefined its geothermal development goal to a planning level that seeks to have geothermal development first meet the energy requirements of the Big Island. This downsized project would not include an inter-island submarine cable system. If this goal is successful, only then would the State consider a large-scale geothermal and inter-island cable project.

DOE has previously prepared appropriate NEPA documentation for separate Federal actions related to Phases 1 and 2 research projects, both of which have been completed. The HGP EIS will assess the potential impacts of Phases 3 and 4, and of reasonably foreseeable alternatives to meet the State's energy goals, such as the use of biomass, coal, solar thermal and photovoltaic, and wind energy (or some combination of these), and construction and operation of commercial geothermal power production facilities on the Big Island.

*A list of acronyms and abbreviations is given in Appendix E.

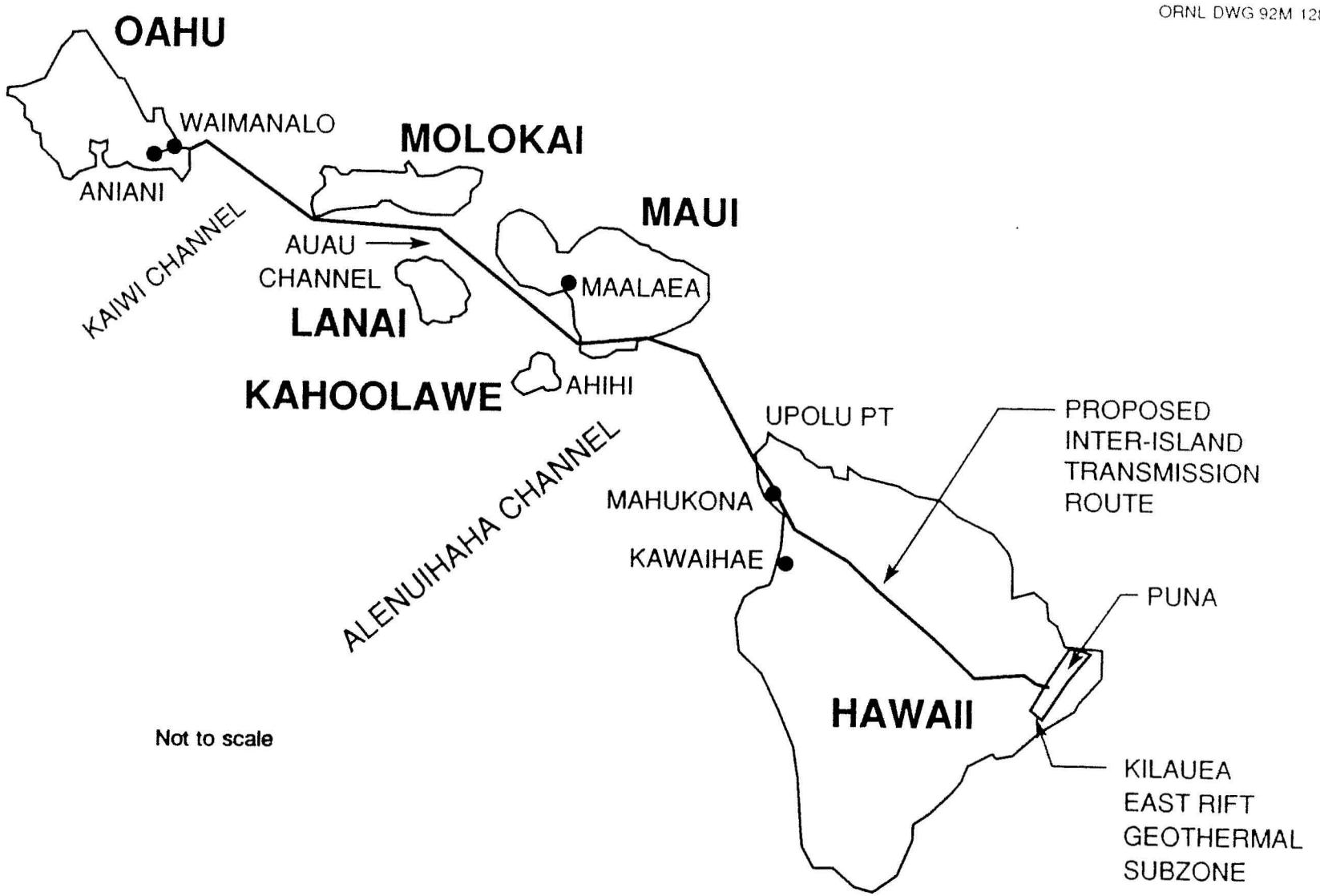

Figure 1.1. Proposed location of the Hawaii Geothermal Project and cable. *Source:* Hawaiian Electric Company, Inc., *Request for Proposal for the Geothermal/Inter-Island Transmission Project,* Hawaiian Electric Company, Inc., Honolulu, Hawaii, May 1989.

for exclusive use on the Big Island. In addition, the EIS will consider the reasonable alternatives among submarine cable technologies; geothermal extraction/production, and power generating technologies; pollution control technologies; overland and submarine power transmission routes; sites reasonably suited to support project facilities in a safe and environmentally acceptable manner; and non-power generating alternatives, such as conservation and demand-side management.

1.1 PURPOSE OF THE EIS IMPLEMENTATION PLAN

DOE has prepared this Implementation Plan (IP) for two purposes: (1) to provide guidance for the EIS preparation, and (2) to record results of the scoping process. To serve these purposes, this IP has been prepared in accordance with DOE NEPA Regulations (57 *Fed. Reg.* 15122, April 24, 1992) (to be codified at 10 CFR Part 1021). The IP has been made available at this time to inform the public of DOE's approach in preparing the EIS and to document the results of the public scoping process. The IP is a "living document" in that it may be amended as needed throughout the preparation of the EIS to incorporate changes in schedules, alternatives, or other content. The IP will be given broad distribution by including agencies and organizations on a mailing list compiled by DOE to provide information about the preparation of the EIS. In addition, the IP will be placed in all DOE Reading Rooms and other resource locations throughout the State of Hawaii (see Attachment 1 to Appendix A for a list of Reading Rooms).

Section 2 of this IP describes the treatment of alternatives. Section 3 discusses the scoping process, includes a discussion of the major issues identified through public scoping, and as appropriate, states how these issues will be addressed in the EIS. Consultations with agencies, preparers of the EIS, significant EIS milestones, and related environmental documentation are described in Section 4. Section 5 contains references cited in preparing the IP. The seven appendices to this IP contain a summary of oral and written scoping comments, a summary of agency scoping comments, a preliminary outline for the EIS, a glossary of terms used in the IP, a list of acronyms and abbreviations, copies of the Advance Notice of Intent and Notice of Intent, and the contractor disclosure statements. Comments by the cooperating agencies on a working draft of the IP (Appendix B) are addressed in this IP.

1.2 BACKGROUND OF HAWAII GEOTHERMAL PROJECT

1.2.1 Purpose and Need

The purpose of the DOE action is to assist the State of Hawaii in developing its indigenous geothermal resource for the production of electricity. Currently, the State of Hawaii uses petroleum for approximately 90 percent of its electrical energy, the highest percentage usage of all 50 states. The State has declared in its 1990 proposal to Congress, its 1991 Hawaii Integrated Energy Policy Program, and its 1991 State Functional Energy Plan that alternatives are needed to help reduce the State's heavy dependence on imported oil as an energy source. Thus, the EIS examines the HGP in the context of reasonably foreseeable alternative means of meeting the State of Hawaii's energy goal.

1.2.2 Description of HGP Phases 1 and 2

The HGP is the culmination of research and development efforts begun in the mid-1970s to explore the feasibility of using Hawaii's indigenous geothermal resource for the production of electricity. Geothermal exploration began in Hawaii in 1972 with funding from the National Science

Foundation (NSF). A high-potential geothermal resource site was identified on the east rift of the Kilauea volcano on the Big Island. Subsequent exploratory drilling (also funded by NSF) between December 1975 and April 1976 resulted in a productive geothermal well at a depth of approximately 6450 ft. In 1976, the Energy Research and Development Administration, a predecessor to DOE, funded the testing of the geothermal well, which was designated as the HGP-A well. In 1979, DOE funded the development of a 3-MW(e) demonstration power plant at the HGP-A site. In 1986, the HGP-A facilities were transferred by DOE to the State of Hawaii to be used for further research. The State has referred to this early exploration and testing of the Big Island geothermal resource as Phase 1 of the HGP.

DOE also provided funds for the Hawaii Deep Water Cable Program (HDWC), which was initiated in 1981 and completed in 1991. The goal of the HDWC was to determine the technical feasibility of constructing and operating a deep water submarine power-transmission cable that would serve the Island of Oahu and would operate for a minimum of 30 years. This project demonstrated the feasibility of deploying and retrieving the deep water power-transmission cable. The State of Hawaii referred to the HDWC as Phase 2 of the HGP.

Over an 11-year period, DOE has provided approximately $33 million for geothermal and deep water cable research in Hawaii, which is about 80 percent of the cost of the HGP Phases 1 and 2. The State and others cost-shared the balance of costs for these HGP phases.

1.3 PROPOSED ACTION

In its 1990 proposal to Congress, the State of Hawaii requested additional Federal funding for what is defined by the State as Phase 3 of the HGP: resource verification and characterization. In 1990, Congress appropriated $5 million (Pub. L. 101-514) for the State's use in Phase 3. Because Congress considered Phase 3 work to be research and not development or project construction, Congress indicated that this funding would not be considered a major Federal action under NEPA that would typically require an EIS. However, because the project is highly visible, somewhat controversial, and involves a particularly sensitive environment in Hawaii, Congress directed in 1991 (House Resolution 1281) that ". . .the Secretary of Energy shall use such sums as are necessary from amounts previously provided to the State of Hawaii for geothermal resource verification and characterization to conduct the necessary environmental assessments and/or environmental impact statement (EIS) for the geothermal initiative to proceed." In addition, the U.S. District Court of Hawaii, in litigation filed by several environmental groups (Civil No. 90-00407, June 25, 1991), ruled that the Federal Government must prepare an EIS for Phases 3 and 4 of the HGP before any further disbursement of Federal funds was made to the State for the HGP.

1.3.1 DOE Decision

The decision to be made by DOE in its Record of Decision is whether or not to partially fund Phase 3 of the HGP, as defined by the State in its 1990 proposal to Congress, using any funds remaining from the $5 million Congressional appropriation for Phase 3 after EIS expenditures. The funding for Phase 4 is currently uncertain.

The EIS will evaluate the activities to be conducted during both Phases 3 and 4 of the HGP as required by Congressional directive and U.S. District Court of Hawaii ruling. However, the DOE decision will be rendered only with regard to the disbursement of Federal funds to the State to partially fund Phase 3.

1.3.2 Description of HGP Phases 3 and 4

The State of Hawaii considers the unknown extent of its geothermal resource to be one of the primary obstacles to private investment and commercial development in geothermal energy production. State and private industry experts estimate that at least 25 commercial-scale exploratory wells would need to be drilled to verify the generating potential of the resource (these wells will, if possible, be used in Phase 4). To that end, Phase 3 activities would include well drilling, logging of cores from holes, measuring temperatures, collecting and analyzing geothermal fluid samples, and making downhole geophysical and geochemical measurements. Information on the feasible locations for Phase 3 activity and details regarding the methods of analyses will be obtained from various sources, including the U.S. Geological Survey (USGS), State of Hawaii, University of Hawaii, DOE, and developers.

Forecasts based on resource characterization to date indicate that between 10 and 20 separate geothermal power plants of 25 to 50 MW(e) each could be developed to produce a maximum of 500 MW(e) (net) of power delivered to Oahu. The actual number of plants would depend on the extent of the resource defined in Phase 3. Because the exact location of plants would not be known until Phase 3 was completed, the EIS will rely on best available data and information to encompass impacts at development sites. Further NEPA documentation may be required for specific projects and permits identified in the future. Based on the physical characteristics of the resource and contemporary geothermal energy development practice, the State estimated that about 125 production wells and 30 injection wells may be needed to produce 500 MW(e). The power plants, to be constructed in Phase 4, most likely would be connected by a network of roads, piping, and overland transmission lines. In addition, overland and underwater transmission lines (±300 kV) would be constructed to distribute power to Oahu and other islands (see Figure 1.1). Section 2.1.4 contains a description of the transmission cable system.

For purposes of the EIS analysis, a typical geothermal power plant may be briefly described as consisting of a moderate size [~30 MW(e)] single-flash, condensing cycle turbine coupled to a generator. Geothermal steam would pass from the well head through a separator and a demister, then to the turbine. The system would allow complete bypass of the turbine directly to the condenser. A two-stage steam ejector would remove gases from the direct-contact-type condenser. Non-condensable gases including hydrogen sulfide (H_2S) would be compressed, mixed with other spent geothermal fluids (brine and steam condensate), and then injected by surface pumps into the general vicinity of the geothermal reservoir. Steam condensate from the condenser would be cooled by a forced draft cooling tower. Power plant, transmission line, and submarine cable technologies will be further defined as the EIS progresses, using information from various sources including the Hawaiian Electric Company (HECO), the State of Hawaii, USGS, the University of Hawaii, Puna Geothermal Venture, True Geothermal Energy Company, Mission Energy Company, Mid-Pacific Geothermal, Inc., Campbell Estate, and DOE. In addition, various development scenarios will be considered based on the extent of the resource and other factors. Because no specific plant design has been proposed for the HGP, a reasonable composite or typical design based on current information will be used to assess potential impacts.

According to the State of Hawaii (DBED 1988), the 500 MW(e) of electrical power was expected to be delivered to the Island of Oahu. A recent evaluation of transmission losses associated with high-voltage direct current (HVDC) delivery of

500 MW(e) from the Big Island to Oahu indicated a gross electrical generating capacity requirement of 520 MW(e), or a 4 percent total HVDC transmission system loss including converter station losses (Bonnet 1992). HECO indicated that it was interested in purchasing up to 500 MW(e) of geothermally generated power. The Maui Electric Company (MECO) also has indicated some interest in whether a tap for 50 MW(e) from the project's transmission system is technically feasible (HECO 1989). Other configurations of the HGP including more or less power production are possible, depending on the extent of the geothermal resource and other variables. For purposes of the EIS, the proposed project will be defined as the development of sufficient gross capacity for delivery of 500 MW(e) (net) to Oahu. Alternatives will consider variations that develop up to the net capacity of 500 MW(e), but not more. Some alternatives that would develop less than the net capacity will be considered in the EIS, as well as transmission and delivery of some of the geothermal power to Maui and the Big Island.

In the 1990 proposal to Congress, the State projected that permitting and financing for Phases 3 and 4 would occur in 1991, and that 500 MW(e) of power could be on-line by 2005. Compliance with State and Federal legal and environmental requirements is likely to extend this schedule. As discussed above, the State has redefined its geothermal development goal from the four-phased, 500-MW(e) inter-island project to first meet the energy requirements of the Big Island, thus initially excluding the inter-island submarine cable (see Section 1).

1.4 RELATIONSHIP TO OTHER GEOTHERMAL DEVELOPMENT ACTIVITIES

As discussed earlier, geothermal power development activities have been underway along the east rift of the Kilauea volcano on the Big Island since the mid-1970s, with exploratory drilling having occurred as early as 1961. The earliest power-producing well was the HGP-A well funded by DOE, which operated in the 1980s (see Section 1.2.2). A number of other geothermal development activities have occurred since the 1970s, some of which are still active. These include developers such as the Puna Geothermal Venture, the True Geothermal Energy Company, Mid-Pacific Geothermal, Inc., and the State's Scientific Observation Hole research program. Non-Federal environmental documentation was prepared for each of these activities (see Section 4.4). The HGP EIS will *not* reevaluate the environmental impacts of these activities. However, impacts of these other activities may contribute to cumulative impacts of the HGP. The CEQ NEPA regulations define cumulative impacts as those resulting from the incremental impact of an action when added to the impacts of other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes them. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Known impacts from other geothermal development on the Big Island will be factored into the HGP impacts analysis, as appropriate.

1.5 EIS COOPERATING AGENCIES

As part of the scoping process, DOE invited other agencies to participate in the EIS preparation as cooperating agencies. Cooperating agency roles and responsibilities in EIS preparation, as defined in the CEQ regulations (40 CFR Part 1501.6), can include participating in the scoping process, developing information, preparing environmental analyses, providing technical reviews, and/or lending staff support. The U.S. Army Corps of Engineers (COE), the U.S. Fish and Wildlife Service (FWS),

USGS, the National Park Service (NPS), the National Marine Fisheries Service (NMFS), the State of Hawaii, the County of Maui, and the County of Hawaii have agreed to be cooperating agencies on the HGP EIS. Memoranda of Understanding have been signed by DOE and each cooperating agency. In addition, FWS, USGS and COE are being funded by DOE to conduct technical support studies to assist in preparation of the EIS.

Details of FWS, USGS, and COE technical support studies are currently under review; preliminary plans for the studies are discussed in Sections 3.3.1, 3.3.3, and 3.3.4. In general, support from FWS will include a literature review, native forest bird survey, vegetation community survey, survey of threatened and endangered species, wetland and floodplain inventory, assessment of non-native species introduction at existing geothermal facilities, and an invertebrate survey. Support from USGS will include a literature review, geothermal fluid characterization, determination of volcanic gas emissions, groundwater resource evaluation, volcanic and deformation hazard analyses, seismic hazard analysis, and estimation of the potential for undersea slides and turbidity currents. COE will provide a literature review, a wetland map unit legend, and delineation of wetland types.

It is important to note that the proposed FWS, USGS, and COE technical studies are being supported by DOE to satisfy CEQ requirements (40 CFR Part 1502.22) regarding "incomplete or unavailable information." CEQ states that "If the incomplete information. . .is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement." In addition, these studies are necessary to provide data and analyses sufficient for DOE to conduct effective consultations with agencies who have statutory and regulatory responsibilities (see Section 4.1, Tables 4.1 and 4.2). On the other hand, CEQ allows that, if costs are prohibitive and/or the means to obtain information are unknown, an "agency shall include within the environmental impact statement: (1) a statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community."

2. TREATMENT OF ALTERNATIVES

2.1 ALTERNATIVES WITHIN THE PROPOSED PROJECT

2.1.1 Development Scenarios

Forecasts based on resource characterization indicate that 10 to 20 separate geothermal power plants of 25 to 50 MW(e) each could be developed under the State's original 1990 HGP proposal to produce a maximum of 500 MW(e) (net) of power delivered to Oahu. The actual number of plants would depend on the extent of the resource defined in Phase 3. Because the exact location of plants will not be known until Phase 3 is completed, the EIS will rely on best available data and information to encompass the possible impacts at the development sites. Various development scenarios will be prepared for the EIS using information that has been collected over the years on the geothermal potential of the Kilauea East Rift Zone (KERZ) and energy demand forecasts

provided by HECO and its wholly owned subsidiaries MECO and Hawaii Electric Light Company, Inc. (HELCO).

2.1.2 Geothermal Technologies

Alternative geothermal technologies will be described and considered in the EIS. Based on the physical characteristics of the geothermal resource and contemporary geothermal energy development practice, the State previously estimated that about 125 production wells and 30 injection wells may be needed to produce the 500 MW(e) (DBED 1992). For the EIS, reasonably foreseeable geothermal technology options will be considered using best available information from geothermal developers, the State of Hawaii, and others. These options will include, but are not limited to, the use of conventional cooling towers using condensate as cooling water, reinjection of all fluids, and individual power generating units between 25 and 50 MW(e) each.

2.1.3 Alternative Sites

In the State of Hawaii, the production of electricity from geothermal resources can occur only in geothermal resource subzones (GRSs). Alternative sites for geothermal development and construction of power plants and associated facilities will be considered within three State-established GRSs of the KERZ on the Big Island. These include the Kilauea Middle East Rift Subzone, Kilauea Lower East Rift Subzone (Kamaili section), and Kilauea Lower East Rift Subzone (Kapaho section). One GRS on Maui will not be considered because it is not expected to be economical for power generation and therefore is not comparable to the GRSs on the Big Island. Alternative sites will be chosen based on the best available information on the potential commercial development of these GRSs for near-term geothermal development.

2.1.4 Alternative Cable and Transmission Line Routes and Technologies

The EIS will define potential alternative overland transmission routes based on route configurations in HECO (1989) (Figure 1.1), existing overland transmission routes, and future discussions with Hawaii State and County governments and utilities. The EIS will also address alternative transmission technologies as they are identified. The EIS will compare the impacts of direct current (dc) vs alternating current (ac) transmission based on existing literature and experience in other locations.

The EIS will also address various alternatives related to different submarine cable routes and different submarine cable technologies. Various cable routes, based on prior HDWC studies and on-going consideration, will be evaluated in the EIS with regard to competing uses along the route and their impacts to marine species, economics, maritime safety, and Native Hawaiian concerns, in addition to consideration of extreme event occurrences. The EIS will consider alternative cable materials and different transmission systems. The potential impacts of alternative land-sea transitions will be evaluated.

2.1.4.1 Cable Routes

A number of optional cable routes have been proposed and are described elsewhere (HDWC 1985a,b). The simplest route would proceed directly from Upolu Point (Big Island) across the Alenuihaha Channel, along the shore at Kipahulu (Maui), along the Maui coast through the channels between Maui and Kahoolawe (Alalakeiki Channel) and Maui and Lanai (the Auau Channel), and across the Kaiwi Channel to Oahu. Other variations include cable (1) ashore on Maui (see Figure 1.1) and (2) ashore on both Maui and Molokai. Differing sea-land transition points for the cable on

the various islands will be considered. Options to be considered will include the possibility of following existing transmission routes. Another alternative to the previously considered routes was presented at the Maui scoping meeting (see Section 3 and Appendix A) and has been reiterated in a written scoping submittal. This alternative route would proceed from the Big Island to Lanai to Oahu, with possible spur lines to Maui and Molokai.

2.1.4.2 Cable Materials and Configurations

Many configurations for the submarine cable have been examined previously (HDWC 1985b,c) from primarily technical and cost bases, including paper-insulated, high-viscosity oil-impregnated, non-pressurized cables, and low-viscosity, oil-impregnated, self-contained, oil-filled pressurized cables. Solid-dielectric cables present another option. Both aluminum and copper were examined as conductors, but only aluminum was found to be acceptable. Since those studies were performed, technologies have advanced, and the bases for costing scenarios have changed. The EIS will review technology advances and review costing for the prior scenarios.

2.1.4.3 High-Voltage dc vs High-Voltage ac Transmission

Current plans for the submarine cable call for HVDC transmission. During scoping, several commenters suggested that if development is staged, then ac transmission over relatively short distances might be cost effective. This assumption will be examined, and the relative environmental impacts of dc vs ac transmission will be discussed based on available literature and experience in other locations.

2.1.4.4 Land-Sea Transitions

Different land-sea transition configurations will be considered based on the need for oil-pumping stations (to maintain pressure in the cables if the self-contained, oil-filled cable is selected) and transformers. If a tap to the local system is required, a conversion station may also be necessary.

2.1.4.5 Multiple Uses of the Cable

Multiple uses of the submarine cable, once it is installed and operational, will be considered in the EIS. It has been suggested that the submarine cable could be used in a reverse mode to transport electrical power from Oahu to the other islands. For example, the EIS will consider the use of residual fuel oil to produce power on the island of Oahu for use there and for possible export to the other islands via the cable. Commenters have suggested that this alternative may be justified in light of potential liabilities from continued inter-island shipping of residual fuel oil.

2.2 ALTERNATIVES TO THE PROPOSED PROJECT

Utilities in Hawaii are currently preparing Integrated Resource Plans (IRPs); therefore, supply and demand options cannot be evaluated on the basis of specific projects at specific sites. Rather, alternatives to the HGP need to be evaluated in the context of various reasonable energy scenarios that would enable the State of Hawaii to meet its energy goals for the next 30 years (i.e., the life of the HGP project). For example, a no-action alternative implies an energy scenario in which the conventional resource options now used on the island (i.e., oil- and coal-fired power generation plants) would continue to play a dominant role.

Conversely, an alternative action involving investments in renewable energy resources and energy conservation would shift the resource mix to lesser dependence on conventional supplies. Thus, to assess the possible environmental and economic impacts of the proposed supply and demand alternatives, it will be necessary to consider alternative energy scenarios for Hawaii. The EIS will also consider a mix of geothermal development and alternative supply-demand options (Section 2.2.2).

2.2.1 No-action

The no-action alternative is defined as "business as usual" (i.e., continued reliance on the existing and planned generating mix of resources), which is predominantly oil-fired capacity with some coal-fired capacity and renewable energy sources. Under the no-action alternative, the energy needs for Hawaii, Maui, Molokai, and Oahu would be achieved using supply or demand-side options on each island. The assessment of the no-action alternative will examine the environmental impacts of reasonably predictable actions that could be taken by others if the proposed action is not taken, as compared with the impacts of going forward with the proposed action.

2.2.2 Alternative Supply-Demand Options

In addition to no-action, two supply-demand alternatives will be evaluated in the EIS. The first is the development of up to 500 MW(e) net of geothermal power for exclusive use on the Big Island, with no inter-island transmission cable. The State of Hawaii's preferred alternative is development of the geothermal resource to meet the projected needs of the Big Island, and submarine cable to export some level of power at a later date if the geothermal resource and project economics justify the cost of a cable. Although a definite geothermal development scenario has not yet been proposed, the EIS will examine an alternative geothermal generating capacity of 100 MW(e) or more [up to 500 MW(e) net] for the Big Island only. The lesser amount represents the geothermal capacity that is currently permitted for development on the Big Island only.

The second supply-demand option would consist of conservation and demand-side management (DSM) alternatives and a mix of currently feasible renewable energy sources (e.g., biomass, solar thermal, wind, geothermal, and photovoltaics). DSM refers to the reduction of demand for energy through electrical load management, energy conservation, and improvements in energy utilization to reduce energy demand.

All alternative supply-demand options will be compared and assessed within the framework of IRP using available data and methods developed for the State utilities' IRP, currently in progress. Where possible, the supply-demand options will be characterized in terms of their relative cost, fiscal impacts, contribution to the State's overall energy demand, and environmental impacts.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED CONSIDERATION

Although many alternatives were mentioned during the scoping process, only those alternatives deemed to be viable and reasonably foreseeable within the time frame of the proposed action (i.e., 30 years) will be considered. In general, the alternatives that will not be considered in the EIS were either anticipated to be not technically feasible within the project time frame (e.g., ocean thermal energy conversion, wave and tidal power, and hydrogen as a carrier fuel) or technically feasible but extremely unlikely because of legislative or other impediments. As an example of the latter, the construction of a nuclear power plant in Hawaii is unlikely because of a State constitutional

requirement for a two-thirds vote in each house of the Legislature for such an action [Act XI, Section 8, Hawaii Revised Statutes (HRS)].

During scoping, commenters recommended that the EIS consider transportation alternatives that would reduce petroleum (oil) consumption. One of the State's primary reasons for encouraging the development of Hawaii's geothermal resource is to reduce the State's reliance on imported oil as an energy source. The EIS *will* address the reduction of oil consumption that would result from the development of geothermal capacity and other alternatives (i.e., the amount of oil replaced by the proposed geothermal power generation and other alternatives as part of the energy supply-demand scenarios). However, because various transportation alternatives would not directly affect power generating capacity in Hawaii, they will not be evaluated in the EIS.

In addition to alternative supply-demand options that will not be considered in the EIS, there also are some alternatives to geothermal development that are beyond the scope of the EIS. For example, the GRS on Maui will not be considered as feasible for development as part of the HGP because resource characteristics defined to date indicate that it has direct heat application only and is not believed to be economic for electricity production. Therefore, the GRS on Maui is not comparable to the GRSs on the Big Island.

3. THE SCOPING PROCESS AND RESULTS

CEQ regulations (40 CFR Part 1501.7) require " an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action." This process is termed "scoping" and usually has two phases. During the first phase, the lead agency conducts internal studies to define the proposed action, identify preliminary alternatives, and develop preliminary issue areas to be addressed in the EIS. The second phase involves participation by the public and other agencies. The objectives of public scoping are to notify interested persons, agencies, and other groups of the proposed action and alternatives; solicit their comments regarding environmental issues, alternatives to the proposed action, and other items of interest; and consider those issues in the preparation of the EIS.

CEQ regulations [40 CFR Part 1501.7(a)] require the lead agency to

- invite the participation of affected Federal, State, and local agencies; any affected Indian tribe; and other interested persons;
- determine the scope and significance of issues to be analyzed in depth in the EIS;
- identify and eliminate from detailed study the issues that are not significant or that have been covered by previous environmental reviews, narrowing the discussion of these issues in the EIS to a brief presentation of why they will not have a significant effect on the human environment, or providing a reference for their coverage elsewhere;
- allocate assignments for preparation of the EIS among the lead and cooperating agencies, with the lead agency retaining responsibility for the EIS;
- indicate any public environmental assessments and other EISs that are being, or will be, prepared that are related to, but not part of, the scope of the EIS under consideration;
- identify other environmental review and consultation requirements so that other studies may be conducted concurrently and integrated with the EIS; and
- indicate the relationship between the timing of environmental analyses and the planning and decision-making schedule.

The full range of potential impacts of the proposed project and reasonable alternatives that were identified during scoping will be addressed in the HGP EIS. Appendix A contains a summary of oral and written scoping comments received during the HGP EIS scoping period. It also summarizes a mass mailing concerning religious issues. Appendix B lists by agency the scoping comments received from Federal, State, and County sources. Environmental resource areas and concerns identified during scoping that have the potential for impact include land use, air quality, water resources, ecological resources, geologic resources, noise, health and safety, socioeconomic issues, cultural resources, marine resources, and aesthetic resources. Further information on these and other topics is given in Section 3.3. A preliminary outline for the HGP EIS is presented in Appendix C.

3.1 NOTICE OF INTENT

In accordance with DOE NEPA Implementing Procedures, 57 *Fed. Reg.* 15122 (1992), to be codified at 10 CFR Part 1021, DOE published an Advance Notice of Intent (ANOI) to prepare the HGP EIS in the *Federal Register* (Vol. 56, No. 170, pp. 43585–87) on September 3, 1991. (The ANOI is reproduced in Appendix F.) The ANOI announced the initiation of planning and scoping of the HGP EIS and solicited public input regarding the scope and content of the EIS. In response to the ANOI, DOE received 55 comment letters on EIS-related topics, all of which have been considered in this IP (see Appendices A and B). These comments also assisted DOE in developing the Notice of Intent (NOI) and were the stimulus for a series of DOE information exchange meetings. In September, October, and November 1991, and in March and July 1992, DOE met with Federal, State, and County agencies; environmental, civic, Native Hawaiian, and public interest groups; and utility and geothermal developers (see Table 3.1). On February 5, 1992, DOE extended an invitation to eight Federal, State, and County agencies to become "cooperating agencies" in the preparation of the EIS. This invitation also solicited additional agency comments on the ANOI and the forthcoming NOI.

On February 14, 1992, DOE published an NOI in the *Federal Register* (Vol. 57, No. 31, pp. 5433–37) (reproduced in Appendix F) to announce its intent to prepare an EIS for Phases 3 and 4 of the HGP, as defined by the State in its 1989 proposal to Congress. For purposes of project description, the State's 1989 and 1990 proposals are almost identical. The NOI announced that ten public scoping meetings would be held in Hawaii from March 7 through March 16, 1992 (see Section 3.2). The NOI noted that written scoping comments, which were to be given equal weight with oral comments, would be received until April 15, 1992, for consideration in the IP (see Appendices D, F, G).

3.2 SCOPING MEETINGS

Beginning on March 7, 1992, DOE held afternoon and evening public scoping meetings at each of five locations in Hawaii, as shown below. These meetings were held

Scoping Meeting Locations and Dates

Pahoa (Big Island)	March 7, 1992
Wailuku (Maui)	March 9, 1992
Kaunakakai (Molokai)	March 12, 1992
Honolulu (Oahu)	March 14, 1992
Kamuela/Waimea (Big Island)	March 16, 1992

in compliance with CEQ regulations (40 CFR Part 1501.7) and DOE NEPA Procedures and in concert with DOE's policy to facilitate public involvement in the NEPA process. The purpose of these meetings was to assure adequate opportunity

TABLE 3.1.—*Information Exchange and Cooperating Agency Meetings*

	Information Exchange Meetings
October 1991	Puna Geothermal Ventures (included a site visit); Sierra Club Legal Defense Fund
November 1991	Blue Ocean Preservation Society; Campbell Estate; Coral Reef Foundation; Kaupo Ranch; Maui Tomorrow; Pele Defense Fund; Mayor's Energy Advisory Commission; Big Island Papaya Growers; Big Island Rainforest Action Group with Malu Aina; Citizens for Responsible Energy Development with Aloha Aina; Greenpeace Hawaii; Hawaii Island Geothermal Alliance; Kapoho Community Association; Lani Puna Gardens Association; Puna Community Council; West Hawaii Sierra Club; Native Hawaiian Legal Corporation; National Audubon Society; Natural Resources Defense Council; Oahu Rainforest Action Network; Rainforest Action Network; Sierra Club Legal Defense Fund; Hawaii utilities; Bishop Museum
March 1992	Native Hawaiian Organizations; Pele Defense Fund; Puna Geothermal Ventures (included a site visit); True Mid-Pacific (included a site visit)
July 1992	Pro-Geothermal Alliance; Hawaii Island Geothermal Alliance
	Cooperating Agency Meetings
September 1991	U.S. Department of the Interior (DOI); U.S. Geological Survey (USGS); U.S. Fish and Wildlife Service (FWS); National Park Service (NPS); U.S. Army Corps of Engineers (COE); National Marine Fisheries Service (NMFS); U.S. Environmental Protection Agency (EPA)
October 1991	Hawaii Department of Business, Economic Development, and Tourism; County of Hawaii; USGS; NPS; Hawaii Office of State Planning; Hawaii Department of Land and Natural Resources; Hawaii Department of Health; Hawaii Office of Environmental Quality Control; NMFS; FWS; COE; Hawaii Office of Hawaiian Affairs; Hawaii Office of State Planning
November 1991	County of Maui; County of Hawaii; NMFS; Office of Hawaiian Homelands; State Historic Preservation Officer; State Office of Consumer Advocacy
March 1992	County of Hawaii; USGS; DOI; EPA; County of Maui; Hawaii Department of Business, Economic Development, and Tourism; COE; NMFS; FWS
July 1992	Hawaii Office of State Planning; Hawaii Department of Health; Hawaii Office of Hawaiian Affairs; Hawaii Department of Labor and Industrial Relations; Hawaii Department of Agriculture; EPA; Hawaii Department of Land and Natural Resources; COE; County of Hawaii; NPS; USGS; County of Maui; NMFS; FWS; review of Working Draft Implementation Plan with all cooperators

for public and government agency participation in developing the EIS scope by identifying the issues to be addressed, commenting on the proposed action, and suggesting alternatives to be analyzed. These scoping meetings were recorded, and copies of the meeting transcripts are available at DOE Reading Rooms (see Attachment 1 to Appendix A). DOE has notified all interested parties by mail of the availability of the meeting transcripts. One-hundred seventy individuals provided more than 700 oral comments during scoping meetings (see Figure 3.1). In addition, 230 individuals submitted written scoping comments and other materials to DOE during the scoping period (which originally had a deadline of April 15, 1992; DOE extended the deadline to provide commenters ample opportunity to provide written comments). The majority of the comments in these written submissions came from individuals; however, about 50 organizations, including environmental, public interest, and community groups, also participated by offering comments through representatives. About 1800 scoping comments were received (see Figure 3.2).

DOE also has prepared an extensive mailing list, copies of which are available in the Reading Rooms, identifying parties who are participating in the EIS preparation and who have submitted scoping comments.

3.3 RESULTS OF SCOPING

The following discussions summarize the comments made during the scoping process according to the topics or issues raised. The number of written and oral comments relating to each concern or issue is shown in Figure 3.2. For each general subheading, examples of comments from which each issue was derived are provided, followed by a discussion of how the EIS will address that issue. The discussion also identifies issues that DOE considers to be outside the EIS scope. Scoping comments are summarized in Appendix A.

3.3.1 Meteorology/Air Quality/HGP Emissions

Many commenters expressed concerns about atmospheric emissions from the HGP, especially during an accident. Based on experience with geothermal development and accidents in Puna, commenters suggested a variety of environmental effects that may result from these operations. Of particular concern to the public were the emissions of H_2S and other airborne pollutants from geothermal well venting and their resultant effects on the health of nearby residents; several examples of ongoing effects were noted. Some commenters expressed the concern that such effects are poorly understood and frequently underestimated.

Issues that were identified in the scoping process include

- effects on human health (see Section 3.3.7) of acute, cumulative, and chronic exposure to H_2S and other potential air pollutants (e.g., radon, heavy metals, and organic compounds);
- nuisance effects of H_2S;
- potential synergistic effects among atmospheric pollutants;
- degradation of ambient air quality relative to ambient air quality standards (H_2S, sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, lead, and suspended, inhalable particulate matter)
- validity of existing data regarding H_2S exposure and the validity of using standards for healthy workers as opposed to standards for the general population (see Section 3.3.7);
- sufficiency of air quality monitoring;
- global issues (acid rain, global warming);
- effects of certain meteorological conditions (e.g., air stagnation during both kona and trade wind regimes) on concentrations of pollutants that might affect human health (see Section 3.3.7);

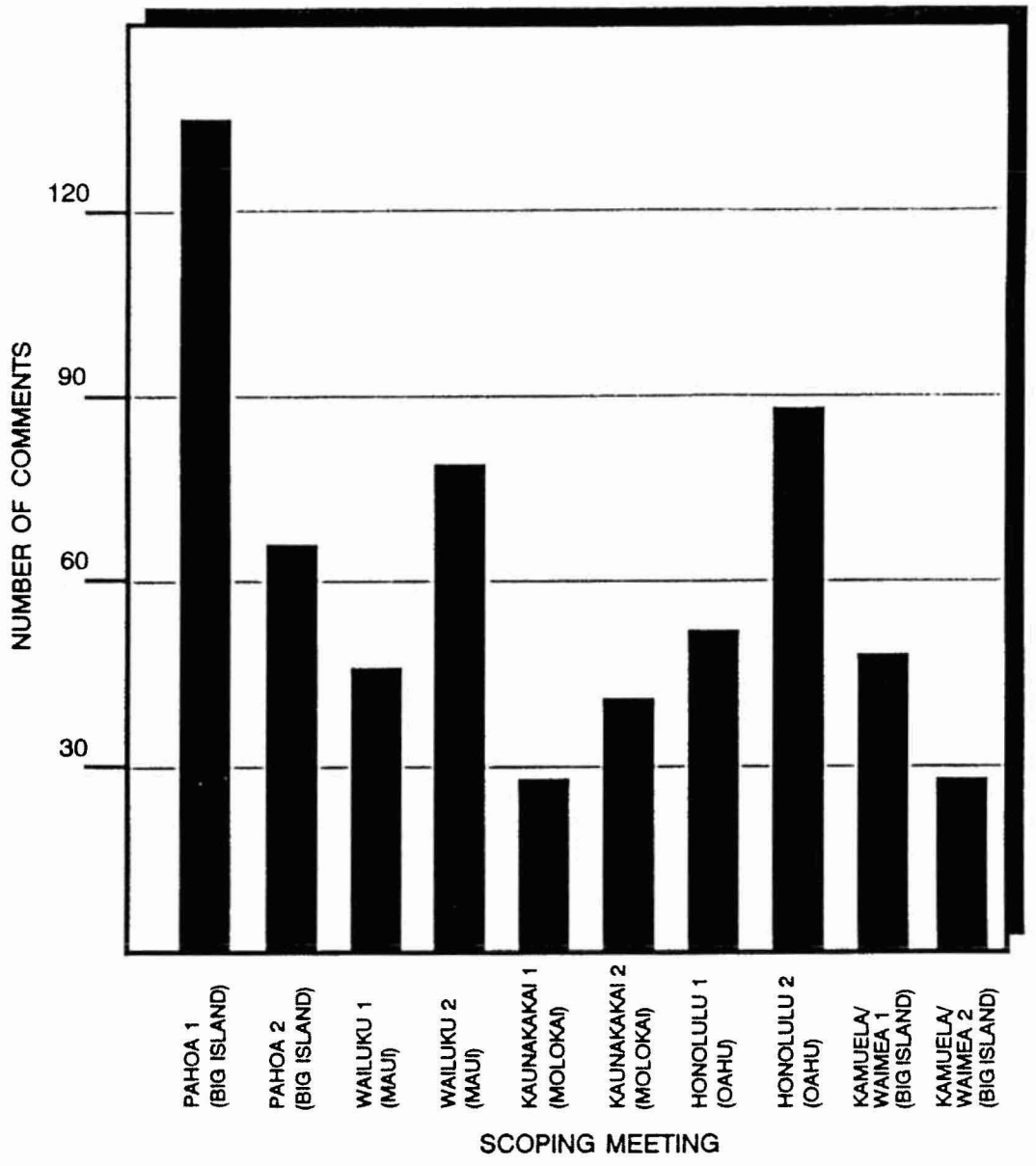

Figure 3.1 Number of oral scoping comments at the ten public scoping meetings for the HGP EIS. More than 700 comments were offered.

- thermal pollution from cooling towers; and
- regional venting contributions due to well casing failures (i.e., corrosion induced).

The EIS will address all meteorological, air quality, and emissions issues listed herein. To address these issues, the EIS will discuss the existing meteorological and climatological conditions characteristic of the Big Island and other islands and the

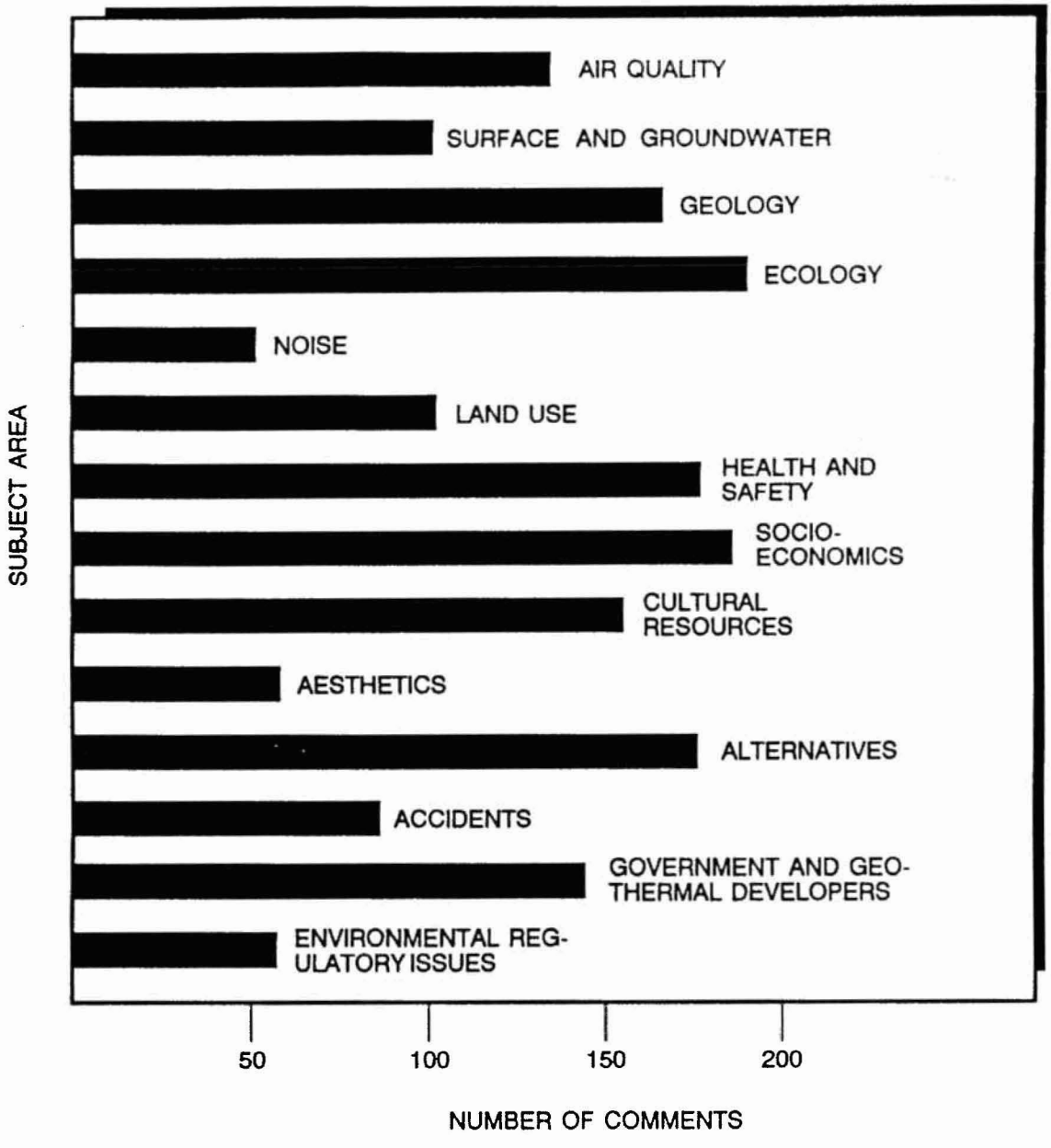

Figure 3.2 Number of oral and written scoping comments by subject area. About 1800 comments were received.

influence of these conditions on air quality. Meteorological conditions necessary for volcanic smog (vog) formation and air stagnation will be described.

The EIS description of ambient air quality will include emissions contributed by existing geothermal development; regional sources, such as volcanoes; and other sources (e.g., agricultural). USGS will provide data on volcanic contributions to ambient air quality. The State of Hawaii Department of Health (DOH), Clean Air

Branch, will provide DOE with recent background ambient air monitoring data for criteria and non-criteria pollutants in the Puna District and will identify non-volcanic emissions sources. Ambient air quality specifically associated with vog will be addressed. Ongoing air quality monitoring (of existing conditions) and any additional or recommended monitoring of air pollutants will be discussed. Where applicable, the EIS will discuss mitigation measures that can be used to achieve the lowest possible emissions rate.

The EIS will identify criteria and non-criteria atmospheric pollutant sources from drilling, construction, and operation of the geothermal power plants as well as potential sources of pollutants that may occur during a facility accident. Additionally, pollutant sources during transmission line construction (primarily particulates) will be identified and quantified. Pollutant concentrations will be estimated using modeling codes approved by the U.S. Environmental Protection Agency (EPA). To assess impacts, background levels of air pollutant concentrations will be added to estimates of pollutant concentrations resulting from the proposed action, and the results will be compared with the National Ambient Air Quality Standards (NAAQS), State of Hawaii standards [including the recently passed State of Hawaii standard for H_2S (DOH 1992)], and other applicable standards.

Prevention of significant deterioration (PSD) of air quality will also be addressed in the EIS. It is possible to conform to the NAAQS and still be in violation of the standards for PSD. The Hawaii Volcanoes National Park (HVNP) is designated a Class I PSD area. Class I areas are designated to severely restrict the degradation of air quality, and specific standards for certain pollutants (nitrogen oxides, sulfur dioxide, and airborne particulate matter) apply. The effects on HVNP will be addressed in the EIS (see Table 4.1). Air-quality-related values such as visibility degradation and objectionable odors will also be addressed in the EIS. These values are of particular importance in national parks and other Class I areas. Consultation with NPS will occur regarding issues related to Class I air quality (see Section 4.1.1 and Tables 4.1 and 4.2).

The EIS will address the impacts of H_2S and other toxic pollutant emissions during routine operations and during facility accidents. H_2S is among both the 189 hazardous air pollutants and 16 extremely hazardous pollutants listed in Title III, Section 301 (r)(3), of the Clean Air Act Amendments of 1990 (Pub. L. 101-549). The Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) recommended H_2S exposure limits (in addition to the new State H_2S ambient air quality rule) will be presented and discussed in the EIS. Because of the importance of H_2S emissions control, measures for pollution abatement and mitigation will be discussed. Any secondary impacts (e.g., waste disposal) resulting from pollution abatement will also be discussed.

Specific issues to be addressed include background ambient air quality, nonattainment (if applicable), hazardous air pollutants, meteorological conditions affecting air quality (e.g., stagnation), fugitive emissions from construction and operation, air quality monitoring, potential synergistic effects among atmospheric pollutants, thermal pollution from cooling towers, emergency response plans (see Section 3.3.7), and noise (see Section 3.3.5). Additionally, the EIS will discuss, to the extent possible, emissions from routine operations that may affect global air quality concerns. These include atmospheric emissions of carbon dioxide, other greenhouse gases, and acid rain precursors.

3.3.2 Surface and Groundwater Resources

Commenters were concerned that well drilling, resource utilization, and well reinjection activities may affect the availability and use of water resources. Surface impoundments (appropriately lined and monitored) would contain mud, brine, and drilling fluids generated during plant construction, and geothermal fluids would be reinjected during normal operation. Residents in the Puna District were concerned about the effects of airborne emissions on the rain water catchment systems used as drinking water (potable) supplies. Airborne emissions may include hazardous and toxic substances (e.g, H_2S, radon, heavy metals, and organic compounds) whose presence could render water from catchment systems unfit for human consumption.

Commenters also noted the complex hydrogeology of the region and the importance of area aquifers and drinking water supplies. All issues raised in this section will be addressed in the EIS. Issues identified during scoping include

- leakage into aquifers due to production and/or injection well casing failures;
- impacts of accidents, such as well blowouts;
- thermal and chemical contamination caused by reinjection;
- impacts to the quality of nearby potable water catchment systems and deep wells;
- dewatering of and/or reduced yield from groundwater resources that could impact availability and use;
- transport of contaminants from HGP-related wastes and effects of drilling effluent brine impoundments, both into underground sources of drinking water;
- erosion control during construction and operation of HGP-related facilities;
- management of point and nonpoint contamination sources;
- groundwater monitoring system requirements, including parameters to be monitored (both water quality and elevation of the water table surface);
- mitigation plan to halt emanating groundwater contamination and/or water table declination detected by groundwater monitoring system;
- complete geothermal fluid characterization;
- identification and mapping of nearby potable water wells that could be affected by HGP-related construction and operation;
- spill prevention, containment, and mitigation methodology;
- source of water for well drilling during construction and well quenching during plant operation;
- well casing and hydrologic monitoring plan for both production and reinjection wells; and
- registration of geothermal wells as water wells.

There is an interrelationship between water resources and geologic resources. Issues related to geologic resources are discussed in Section 3.3.3. Springs and thermal springs are included in the definition of water resources as used in this section; wetlands and anchialine ponds are discussed in Section 3.3.4.

Water resources are also vital to subsistence and religious practices of Native Hawaiians; cultural uses of water resources are addressed in Section 3.3.9. Marine water quality issues are discussed in Section 3.3.4.

Studies will be undertaken to obtain environmental baseline information that is not available in the open literature. Cooperating agency involvement will include the State of Hawaii, USGS, and the County of Hawaii. A water resource inventory that will be provided by USGS, with input from

the State of Hawaii and County of Hawaii, will be included in the EIS (see Section 4).

The State of Hawaii is considering the status of its water quality designation in the geothermal subzone beneath the District of Puna. All analyses of environmental impacts will be based on the water quality designation in effect during the writing of the EIS.

The uses and water quality of surface and groundwater resources in potential development areas and the effects of the HGP on these resources will be discussed in the EIS. Hydrogeological data for the HGP site, and vicinity and HGP source terms for potential effluents and contaminants, will be used to assess the potential for contaminant deposition and transport. Results of these analyses will factor into health and ecological assessments (discussed in Sections 3.3.7 and 3.3.4, respectively). State of Hawaii and EPA-approved underground injection regulations will be used as a basis for groundwater impact analysis. State of Hawaii drinking water quality standards and National Primary and Secondary Drinking Water Regulations (40 CFR Parts 141 and 143) will be the criteria used to gauge the significance of impacts of atmospheric pollutant deposition in catchment systems. Monitoring of conditions for permits issued by the State of Hawaii, as well as written agreements between the State of Hawaii, EPA, and current geothermal developers, will be used to assess reduced yield from groundwater supplies (see Section 4.1 and Tables 4.1 and 4.2).

The water resources impact analysis will describe (1) impacts that occur during normal plant operation, (2) impacts from accidents that are mitigated by safety systems such as shut-off valves, and (3) impacts from severe accidents that could overwhelm safety features designed into the plants (see Section 3.3.12).

3.3.3 Geologic Issues

The location of geothermal facilities on the site of an active volcano concerned many commenters. They indicated that the potential for seismic disturbances and lava flows at the geothermal facilities increased the risk of accidents and created conditions that cannot be addressed by the current state of technology. A geologically active and complex region, they said, is not suitable for industrial facilities. Geologic complexities and the potential for resource depletion also concerned Native Hawaiians, some of whom equate the geothermal resource with the volcano goddess, Pele. (Native Hawaiian religious concerns are addressed in Section 3.3.9. A mass mailing on the subject is addressed in Appendix A.) The rugged and unstable terrain of the marine environment in which the undersea cable would be placed also was noted as an issue.

The principal issues identified in the scoping process were

- normal operations-driven impacts related to withdrawal and reinjection of geothermal fluids, including induced seismicity, induced subsidence, impacts to groundwater quality and use (see Section 3.3.2), and geothermal resource depletion;
- accident-driven and natural geologic hazards impacts (see Sections 3.3.12.2 and 3.3.4.3), including impacts to land-based facilities (earthquakes, volcanic activity, uplift, subsidence, and slides) and impacts to cable routes and shoreline facilities (earthquakes, volcanic activity, uplift, subsidence, slides, turbidity currents, wave action, storm surge, and tsunamis);
- erosion and contamination of soils (see Sections 3.3.4.3 and 3.3.6) due to construction and the routine use of herbicides during operations, and because of accidental spills (human error or natural hazard); and

- comparison of the proposed HGP site with other geothermal development sites (e.g., in Iceland).

The geologic issues listed herein will be addressed in the EIS. Geologic issues concerning both the HGP and the transmission/cable system will be treated in the EIS. The volcanically and seismically active nature of the proposed development area raises a number of geologic issues that require an objective evaluation. Data from site studies and available literature will provide a basis for assessing several geologic issues such as subsidence and withdrawal/reinjection effects. The geologic suitability of the site for HGP facilities also will be assessed.

Geological literature on the Hawaiian Islands is extensive. USGS will assist DOE in collecting and evaluating existing literature. USGS also will assist DOE in analyzing geologic hazards such as volcanic activity (eruptions, including tephra falls, and lava flows), seismicity (including ground motion, liquefaction, induced landslides, and surface rupture), and natural surface uplift and subsidence in both terrestrial and marine environments. In addition, USGS will assist in analyzing geologic natural hazards that are peculiar to the marine and/or shoreline environments (turbidity currents, undersea landslides, tsunamis, and hurricane storm surge). USGS also will assist DOE's analysis of the natural impact of Kilauea's activity on air quality in the Puna District. Finally, USGS will assist DOE with groundwater resources characterization and geothermal fluid chemical characterization.

The HGP EIS will examine the potential for damage to geothermal facilities by fresh lava flows as well as effects of earthquake-induced phenomena such as excessive ground motion, surface rupture, liquefaction, and landslides. Environmental impacts of accidental release of geothermal fluids will be assessed (see Section 3.3.2). The effects of prolonged withdrawal and reinjection of geothermal fluids during plant operations also will be analyzed (see Section 3.3.2). If possible, reservoir engineering characteristics will be used to predict the nature of induced seismicity, subsidence, and geothermal reservoir depletion (the latter is addressed in Section 3.3.2). These analyses will depend on the availability and appropriateness of existing models. Analysis of routine operational impacts will be based on the assumption that automatic shut-off valves and blowout preventers function as intended and that other reasonable safety features (such as flexible joints between steam gathering lines on the surface and well heads) are included. Accident-driven impacts are discussed in Section 3.3.12.

Soils in the Puna District and on transmission line rights-of-way will be described from existing U.S. Soil Conservation Service (SCS) or equivalent surveys. Construction, operational, and accident-related impacts (erosion and contamination) to these soils will be assessed (see Section 3.3.6 and 3.3.4.3). Contamination from accidents and routine spraying (herbicides) of access roads, pipelines, plants, and transmission lines will be addressed. SCS will be consulted (see Table 4.1).

Well completion designs and erosion and sedimentation control plans (ESCPs) will be assessed for compliance with existing State regulations. This assessment will require consultation with the Hawaii Department of Land and Natural Resources, the Division of Water Resources Management, and DOH. County governments and the SCS will be consulted with respect to ESCPs. Effective monitoring of construction- and operation-related erosion and sedimentation is a regulatory requirement of an ESCP. In addition, USGS and County of Hawaii will be consulted during EIS preparation regarding volcanic eruption mitigation measures (see Tables 4.1 and 4.2).

3.3.4 Ecological Resources

A recurring concern expressed by commenters was the effect of the HGP, transmission corridors, and cable construction on ecological resources. A number of commenters cited the uniqueness and value of the Wao Kele O Puna rain forest as an overriding concern. Other commenters identified specific concerns related to effects of the submarine cable in the coastal zone and marine environment.

Ecological resources on the Big Island, along marine cable routes, and at cable landing sites on other islands will be described in the EIS, and the impacts of HGP development, construction, and operation on the resources, including wetlands, floodplains, coastal zones, the marine environment, and species and areas of special concern, will be analyzed. The potential for effects of acid rain or fog on soil quality and on land based terrestrial and acquatic ecosystems as the result of operation of the geothermal extraction and power production facilities will be assessed. Assessment will draw upon existing literature and studies conducted by FWS and COE, including comprehensive surveys of biota (e.g., forest birds, threatened and endangered species, invertebrates, and vegetation), a Hoary bat survey, a native rain forest ecosystem analysis, and wetland delineations. The need for additional data collection is currently being evaluated in consultation with DOE, FWS, COE, and others. NMFS, National Oceanic and Atmospheric Administration (NOAA), and other appropriate experts will be consulted for information on marine resources. Depending on the results of the assessment and the relationship to proposed alternatives, appropriate mitigation action plans will be developed in the preparation of the EIS.

Principal ecological issues for terrestrial, aquatic, and marine resources are listed below; there were several issues common to all ecological areas, while others were specific to one or more resource areas. The EIS will address all ecological issues listed in this section. The following ecological issues were identified during scoping.

General

- impacts from construction of power production facilities, submarine cable system, and transmission corridors;
- effects of atmospheric emissions, liquid effluents, waste disposal and impoundments, and noise; and
- impacts on endemic, threatened and endangered, and sensitive species.

Terrestrial

- deforestation and loss of biodiversity;
- impacts of the HGP and transmission line right-of-way on habitat;
- impacts of electromagnetic field (EMF) on fauna along land transmission corridors;
- impact of corridor construction on fauna and flora, including sensitive plants, threatened and endangered species, and protected habitat;
- effects of emissions and effluents on agricultural crops, livestock, and pets;
- loss or disturbance of wetlands;
- impacts on cave ecosystems and invertebrates; and
- impacts of chemical (e.g., herbicide) control of non-native plants.

Aquatic

- impacts on anchialine ponds as a result of erosion and changes in groundwater hydrology and thermal contamination from reinjection of geothermal fluids (see Section 3.3.9);
- impacts on populations of endemic, sensitive, and threatened and

endangered species and on protected habitat;
- impacts of construction and maintenance of the transmission line rights-of-way on aquatic habitat;
- impacts on aquatic systems from potential water quality alterations (e.g., from runoff, effluents, altered flows and quality of streams, springs, and hot springs); and
- impacts from the use of herbicides to control non-native plant species and for transmission line right-of-way maintenance.

Marine
- impacts of cable installation and operation (especially EMF effects) on marine species, including Hawaiian monk seals, precious corals, humpback whales, rays, skates, sharks, sea turtles, endemic, threatened and endangered, and sensitive species;
- competing use of the undersea transmission cable with coastal zone use for marine emanations and cultural resources (see Section 3.3.9), recreational uses (see Section 3.3.8), and commercial, recreational, and subsistence fishing, shipping, etc.;
- competing use of the transmission cable with marine coastal zones and channels for communications and military cables used for national defense;
- impacts on marine biota due to noise; water quality degradation from runoff, effluents, and oil spills; and perturbations resulting from cable construction and maintenance;
- impacts of construction, operation, and maintenance of production sites, cable landings, and transmission routes on the marine environment (e.g., fish ponds, coastal zone, reefs, and deep water); and
- potential to cause ciguatera (fish poisoning) as a result of cable construction, deployment, and maintenance in coastal reef areas.

3.3.4.1 Terrestrial Resources

Commenters asked that comprehensive surveys of rain forest species be completed and the results evaluated. Moreover, they thought that the EIS should fully investigate the potential short- and long-term impacts of the HGP to pristine environments, such as the rain forest in Hawaii, the southeast coast and Hana districts of Maui, much of Molokai, the marine environment (see Section 3.3.4.3), and other locations potentially affected by the HGP.

The impacts on terrestrial ecosystems will be addressed in the EIS with particular emphasis on the rain forest, wetlands, cave ecosystems (e.g., lava tubes), vegetation, birds, threatened and endangered species, invertebrates, and ethnobotanical and medicinal species. These resources are extremely important to Native Hawaiians, whose culture and religion are closely tied to natural resources (see Section 3.3.9). Potential impacts of invasion of non-native species as a result of the HGP and power transmission corridors will be evaluated, and the impacts to terrestrial ecosystems as the result of controlling non-native plant species with herbicides within the project area will be considered. Associated risks of chemical vegetation control (i.e., the use of herbicides) on humans is considered in Section 3.3.7.

A Geographic Information System (GIS) data base for the project will be built from existing data bases and results from studies to be conducted by FWS (e.g., vegetation community, native bird, threatened and endangered species, and invertebrate surveys) and the COE (e.g., wetlands). GIS will be used to integrate the ecological resource data and analyze potential impacts on terrestrial ecosystems and ecosystem components. Analyses include (1) fragmentation of the rain forest from natural occurrences (e.g., lava flows) and artificial occurrences (e.g., road building associated with HGP development); (2) non-native

species invasion into disturbed and natural areas; (3) potential for the project to contribute to loss of native fauna and flora, including impacts from erosion as a result of construction and maintenance operations; (4) land area impact of (a) well pad size and number resulting from initial development and from expansion as the geothermal resource is depleted and (b) road length; (5) alternative locations of well pads and roads to minimize ecological disturbances; (6) interrelationships among biota, lava flows, and vegetation regeneration; (7) effects of transmission line EMF on terrestrial fauna; and (8) other issues identified as appropriate during data collection.

The extent and types of wetlands within all land areas potentially involved in the geothermal resource area and along transmission corridors will be delineated by COE. EPA will also be consulted concerning wetlands (see Section 4.1). COE will use the 1987 *COE Wetland Delineation Manual* to delineate wetlands. Wetlands maps and supporting data will be provided to DOE for the purpose of performing wetlands assessments based on the practicable alternatives analysis in accordance with Clean Water Act [Section 404(b)(1)] guidelines for dredging and filling. When wetlands are identified, a detailed assessment of the potential impacts on the wetland ecosystem will be made, and approaches for minimizing or avoiding wetland involvement will be discussed. The assessment will include potential impacts on wetland functions, including water quality, hydrology, vegetation composition and structure, habitat for threatened and endangered species, and biological diversity.

The potential for HGP to impact threatened and endangered species and wetlands (see above) requires analyses in the EIS. During EIS preparation, FWS, as well as the State Department of Natural Land and Resources, will be contacted for information and consultation under Section 7 of the Endangered Species Act (see Section 4.1).

3.3.4.2 Aquatic Resources

Commenters identified several issues related to aquatic resources that will be addressed in the EIS. Results of existing studies and those conducted in support of the EIS will be incorporated into the EIS.

Land-based freshwater and brackish-water ecosystems, including streams, springs, and anchialine ponds, and their associated fauna and flora will be identified for all development areas, and potential impacts of the proposed development and alternatives will be addressed in the EIS. The potential impacts to aquatic ecosystems from groundwater quality alteration due to reinjection of geothermal fluids and potential changes in surface water quality will be addressed. Existing information, including that from FWS and NMFS and from studies conducted in support of the EIS, will be used to determine the impacts of the proposed development on land-based aquatic resources. Wetlands will be addressed primarily as part of the terrestrial resources (see Section 3.3.4.1); however, linkages between wetlands and aquatic ecosystems will be addressed in the aquatic resources sections of the EIS.

The potential for impacts to threatened and endangered species in land-based aquatic ecosystems will be addressed using existing information and FWS survey information. During the EIS preparation, FWS, NMFS, the State Department of Land and Natural Resources, and other knowledgeable experts will be contacted for information; consultation as required under Section 7 of the Endangered Species Act will be conducted. The results of these consultations will be included in the EIS (see Section 4 and Tables 4.1 and 4.2).

3.3.4.3 Marine Resources

Commenters identified a number of concerns relative to the marine environment that will be addressed in the EIS. Marine ecosystems, including benthic communities, reefs, coastal zones, and deep water, along the underwater transmission corridors will be identified and described. Impacts could occur in the coastal zone, reefs, benthic communities, or at sea. Species could be affected by siltation, increased turbidity, or water quality changes due to construction (including dredging and drilling), operation, deployment, or maintenance of the HDWC or oil spills. The mechanical operations of cable-related activities (dredging, blasting, cable laying, etc.) can also affect marine species. All these activities are associated with construction in coastal zones, and the impacts of such activities will be assessed (including consideration of competing uses such as shipping and fishing) based on comparable experiences in Hawaii and elsewhere, and by reference to the literature.

The particulate loading and visibility of marine waters may be affected by construction, dredging, drilling, or maintenance, and erosion due to HGP-related activities on land. Particulate matter may alter the dissolved oxygen content, nutrient content, and the concentration of organic carbon in the coastal zone. The impacts of particulate loading, increased turbidity, and siltation due to these activities will be assessed based on the literature and prior experience with similar activities in Hawaii. Knowledge of currents and projected particulate loading will be used to predict the range of increased turbidity and siltation. Leakage from an oil-filled cable (as a result of natural events, accident, or sabotage) or oil spills from associated shipping will be assessed in a similar manner. Species and regions that are particularly sensitive to petroleum products will be identified and the likelihood of contamination determined based on the physical oceanography of the region. Both EPA and the Coast Guard will be consulted.

Impacts to the marine environment from potential damage to and maintenance of the undersea transmission cable and alternatives to the cable will be addressed (see Section 3.3.11.2.2). Scenarios in which an undersea cable may rupture or be severed and produce impacts as the result of strong ocean currents, submarine erosion by ocean currents, and submarine landslides generated by earthquakes will be addressed (see Section 3.3.12.2).

The potential for ciguatera as a result of disturbance of the marine environment during cable construction and maintenance, and mitigation measures to avoid or limit these impacts, will be addressed (see Section 3.3.7). Those impacts that could occur as the result of cable oil leakage and cable accidents will be addressed (see Section 3.3.12.2 and 3.3.7).

Impacts to commercial, recreational, and native subsistence fisheries and fish ponds in the coastal zone and along the transmission cable route as the result of construction and operation of the cable will be addressed (see also Section 3.3.9). Economic impacts associated with the undersea cable in terms of commercial, recreational, and subsistence fisheries, mariculture and fish ponds, use of recreational areas, and use of precious corals will be addressed, as well as those economic impacts associated with cable construction, maintenance, operation, and other related aspects of deployment, retrieval, and rehabilitation.

The potential for impacts to endemic, threatened and endangered, and other sensitive species in the marine environment, including Hawaiian monk seals, humpback whales, skates, rays, and sharks, will be determined. During EIS preparation, NMFS, FWS, NOAA Office of Marine Mammals, the State Department of Natural Resources, and other knowledgeable experts and agencies will be contacted for information and consultation as required under Section 7

of the Endangered Species Act and the Marine Mammals Protection Act (see Tables 4.1 and 4.2).

The EIS will include an evaluation of the potential biological effects on marine life as the result of EMF produced by the submarine cable. There is concern that EMF may affect humpback whales and other sensitive species that use naturally occurring EMFs for navigation. At least three possible cases will be evaluated for potential effects on marine species: (1) fields produced during normal operation of the cable system, including typical static magnetic and electric fields as well as induced fields that may occur during transients and line loading changes; (2) temporary events after damage to one or more of the cables with higher than normal current densities around the damaged cable; and (3) only one cable functioning with current return through the ocean. Impacts associated with staged development in which there could be ac transmission between the islands of Hawaii and Maui will be addressed in the EIS as part of the discussion of alternatives to the proposed action.

Certain marine animals (e.g., sharks, rays, and skates) have specific sensory organs that detect extremely weak electric or magnetic fields that aid in navigation and foraging. Effects on behavior patterns, including potential attraction, may occur as the result of transmission line fields such as would be associated with the proposed undersea cable. The available knowledge regarding the effects of these fields on sensitive marine life will be reviewed, and pertinent information will be obtained from other cable transmission studies to address the potential impacts associated with this issue. This information, along with the calculations of the fields produced by the proposed undersea cables, will be used in the EIS to predict potential impacts on sensitive marine life.

The EIS will include an evaluation of the potential effects of noise during cable route construction and maintenance on sensitive marine biota. For example, effects of noise on breeding, calving, and migration of humpback whales will be assessed.

3.3.5 Noise

Some commenters pointed out that well drilling and venting from HGP development and operations will create noise. Well drilling and venting from current local geothermal developments were often cited as activities that produce intense noise. Noise is also associated with transmission lines, especially in moist conditions. Quiet conditions (with respect to human-produced sources) currently prevail in the area where noise impacts resulting from the proposed activity are expected.

Noise issues that were identified in the scoping process include

- occupational and public health impacts of noise from drilling, construction, and (unannounced) venting operations, and possible associated exceedances of standards of the Occupational Safety and Health Administration (OSHA) and the National Institute of Occupational Safety and Health (NIOSH) (see Section 3.3.7);
- effects on terrestrial and marine fauna;
- nuisance impacts related to noise (e.g., loss of sleep) (see Section 3.3.7);
- noise associated with construction and maintenance of transmission lines; and
- noise associated with high tension transmission lines, especially the crackling noise produced by the lines during inclement weather or during periods of high humidity.

All noise-related issues listed herein will be addressed in the EIS. The EIS will use existing data provided by qualified professionals specializing in noise characterization to describe and assess noise impacts. Noise measurements will include ambient levels as well as noise resulting from

existing geothermal activities (drilling and operating). Noise contours will be developed. The noise measurements will include day and night levels, peak levels, and energy-averaged levels. Noise from both normal operation (including transients) and upset conditions will be described.

The EIS will assess and evaluate potential impacts of noise to the affected residential population and to terrestrial and marine species, and adaptation by these species to noise will be discussed.

The EIS will also examine the potential for noise-induced hearing loss associated with the HGP. The noise levels associated with hearing loss will be compared with expected noise contours from HGP operations. Compliance with applicable public and occupational standards and guidelines for noise, including psychological effects, will be addressed in the EIS. Noise-related annoyance to residents living near well-drilling, construction areas, or other geothermal activities will also be addressed. Noise associated with the use of aircraft for construction and maintenance of HGP facilities and along transmission lines will be assessed. Noise abatement and mitigation measures (e.g., rock mufflers) will also be addressed.

3.3.6 Land Use

Commenters raised a variety of land-use concerns, especially those pertaining to compatibility between residential use and the HGP. All issues raised in this section will be addressed in the EIS. Specific issues that were identified in the scoping process include

- compatibility of HGP plants and transmission facilities and corridors with competing residential, commercial, agricultural, coastal, and military land uses, conservation lands, Native Hawaiian homelands, and the Hawaii Volcanoes National Park (HVNP) and other land preserves;
- compatibility of HGP plants and transmission facilities and corridors with planned land uses in the areas listed above;
- land-use impacts of expanding geothermal development as the resource is depleted;
- impacts on unique land resources, such as the Wao Kele O Puna rain forest;
- changes in traditional land ownership and land-use patterns as a result of the HGP; and
- impacts on coastal zone land uses including mariculture, recreational and subsistence fishing, and other commercial, recreational, and cultural uses of coastal areas.

Land-use issues will be addressed in several sections of the EIS. Land use as it relates to agriculture, ecological issues, and unique land resources will be discussed under the terrestrial ecology heading (see Section 3.3.4). Land-use issues related to Native Hawaiian interests and culture and changes in traditional land use will be discussed separately (see Section 3.3.9), and land-use issues related to compatibility, expanded development, coastal impacts, and economics will be discussed in the socioeconomics sections of the EIS (see Section 3.3.8).

To assess potential land-use impacts, the EIS will estimate the total land area that would be required for the HGP plants and transmission facilities and corridors, identify existing and planned land uses in the proposed vicinity of HGP plants and transmission facilities and corridors, and determine the extent to which construction and operation of the HGP would affect those land uses. Agencies that will provide information about existing and planned land uses include the Counties of Hawaii and Maui, NPS, COE, and the State of Hawaii (e.g., the Department of Land and Natural

Resources and the Office of State Planning). In particular, County Community Development Plans for affected Counties and the State's statutes regarding the designation and regulation of GRS (Sections 205-5.1 and 205-5.2 HRS) will be consulted (see Table 4.1).

3.3.7 Health and Safety

Participants in scoping expressed concern about health risks to workers and the public from routine operations and accidents.

Issues that were identified in the scoping process include

- acute and chronic health and safety impacts of routine emissions (via air and water pathways);
- HGP accidents—effects on human health (see Section 3.3.12.2);
- cable accidents (see Section 3.3.12.2);
- effects of uncontrolled, unabated well venting and blowouts;
- occupational safety;
- EMF effects;
- psychological effects of construction, operation, and potential accidents;
- effects of hazardous materials and wastes, including the use of herbicides to control non-native plant species and for transmission line right-of-way maintenance;
- health impacts of herbicide use in the rain forest and along transmission lines, including potential impacts to plants used for medicinal purposes (see Section 3.3.9);
- synergistic effects on sensitive individuals;
- cumulative effects of planned full-scale development;
- ciguatera associated with cable construction in the near-shore environment;
- threats of civil disorder associated with the potential for accidents; and
- fire hazards in dry areas due to transmission lines.

The EIS will address all of the health and safety issues listed herein. The EIS will evaluate health and safety impacts as they relate to both operations and accident conditions, including uncontrolled and/or unabated venting. The analyses will be based on the 500-MW(e) development scenario. Although effects of this larger development will have a cumulative nature, the basic methods for addressing different situations are similar. For public exposures, the first step is to identify the materials that will be emitted to air or water. These would include H_2S, radon, heavy metals, and organic compounds emitted to the air (see Section 3.3.1) or deposited in water; in addition, because of their potentially widespread use, herbicides will be examined as a source of public exposure. The next steps are to consider the various transport pathways, such as inhalation, dermal exposure, food, and drinking water, and then calculate intake either on a continuous basis or under accident (episodic) conditions. These intakes then are converted to health effects via dose-response relationships. In addition, potential occupational exposures will be evaluated, to the extent possible, with respect to OSHA and NIOSH regulations. Certain operations that disrupt the near-shore marine environment can result in ciguatera. This, in turn, can be directly harmful to people who consume toxic fish, or indirectly harmful in depriving individuals of a source of food. The extent to which these effects may be harmful and/or mitigated will be discussed.

Of special concern are hazardous materials, including waste, which may be present at geothermal sites. To the extent possible, these will be listed along with applicable regulations. Drilling muds and waste ponds represent a source of possibly toxic materials, and they may pose a special waste disposal challenge. To the extent

possible, the contents of such muds and ponds will be characterized so that any potential health effects issues can be quantified and future waste disposal requirements can be identified. The human health effects of herbicide, which would be used to control non-native plant species in the geothermal development subzone and vegetation along the transmission corridor, will be addressed.

Public concern over the possible health effects of EMFs associated with power generation and transmission has increased sharply in recent years. The EIS will include an evaluation of EMFs near the power generation facilities, along the transmission line rights-of-way, at the conversion stations, and at ocean entry and exit points. Consideration of possible EMF impacts in the marine environment is discussed in Section 3.3.4.3. Because economics or emergency situations may dictate the need for single-cable operation, safety issues associated with ocean return currents during single cable operation will also be evaluated as appropriate. In addition, a section will be prepared that summarizes the most recent scientific understanding of the possible long-term effects on humans. Consideration of possible impacts on marine life is discussed in Section 3.3.4.3.

Accidents, which could result from natural phenomena or from a variety of human factors including operator error, and choices of materials and designs, will be assessed in the EIS. Human health effects of accidents will be assessed in the health and safety sections of the EIS. Other impacts of accidents will be assessed where appropriate in the EIS (see Section 3.3.12).

The EIS will address the effects of sleep deprivation and emergency evacuations related to the construction and operation of geothermal facilities (e.g., noise, H_2S or other emissions, night lighting). Comments received from residents in the Puna District indicated a concern for their general health, with some commenters referring to a general "malaise" associated with living near the existing geothermal development. The EIS will review the literature on identified emissions and sources for potential contributions to "malaise."

The EIS will address emergency preparedness needs both on the HGP site and in the Puna District that may arise from the proposed project and will discuss alternative mitigation measures that could be incorporated as remedial actions. The EIS will examine whether the proposed and alternative actions would increase the risk of lethal accidents or lead to potential for harm to resident populations, and will assess the adequacy of the existing resources within the community available to respond to those consequences. The potential problems of uncontrolled venting will be addressed, especially for areas where single routes exist for emergency evacuation of residents affected by possible H_2S emissions. The EIS will discuss mitigative measures that may be needed to ensure citizens' health and safety, such as monitoring stations within the community, early warning or call-down systems for more sensitive populations (e.g., the elderly, infirm, or the very young), evacuation via helicopter in remote locations, and the use of outside agencies to ensure compliance from geothermal developers on coordinating efforts with local officials for adequate warning systems. The EIS will address the current problem of communicating warnings in remote areas to potentially affected residents. Emergency preparedness will be discussed in light of the existing State Department of Health (DOH) H_2S standards, the Federal Emergency Management Agency's *Guide for Development of State and Local Emergency Operations Plans* (1985) and the supplement to that document, *Guide for the Review of State and Local Emergency Plans* (1988), the requirements of Title III of the Superfund Amendments and Reauthorization Act (1986) mandating public disclosure of chemical release information and the

development of emergency response plans (see Table 4.1).

3.3.8 Socioeconomics

Socioeconomic concerns were expressed by many commenters. Scoping participants noted that the potential social and economic costs and benefits of the HGP are complex and need to be evaluated in detail. Socioeconomic concerns ranged from the local effects of the HGP (e.g., effects on property values) to more general concerns (e.g., economic effects on Hawaiian tourism and industry). Specific socioeconomic issues that were identified in the scoping process include

- the need for an accurate estimate of the total cost of the HGP to consumers, rate payers, taxpayers, and utilities from inception to decommissioning and rehabilitation. Total costs should include the costs of construction, operation, impact mitigation, environmental monitoring and enforcement, decommissioning, rehabilitation, and the cost of drilling additional wells because of resource depletion;
- the impacts of further industrialization (especially heavy industry) as a result of increased power availability from the HGP and alternatives, particularly in terms of a proposed commercial rocket launching facility and a proposed manganese nodule refining facility on the Big Island [see, for example, DOI (1990)];
- effects on property values near HGP facilities and along the transmission line corridor;
- effects on electric rates (because of the HGP's cost and perceived reliability) in comparison to the no-action alternative and to conservation and demand-side management (DSM) for the same amount of power;
- increasing tourist developments and economic dependence on tourism;
- impacts of the HGP on life styles and quality of life of the general population, including Native Hawaiians (see Section 3.3.9);
- the cost to consumers, rate payers, taxpayers, and utilities of providing backup utility capacity for the HGP because of the project's perceived reliability;
- the total cost to consumers, rate payers, taxpayers, and utilities of property destruction (e.g., because of HGP-related corrosion), property condemnation, relocation, and/or financial reimbursement to nearby residents and businesses due to liability-related issues;
- economic impacts on terrestrial land uses, including agriculture, recreation, and tourism;
- economic impacts on the marine environment, including commercial, recreational, and subsistence fishing, mariculture, tourism, and recreation;
- economic effects of the HGP's visual impacts (e.g., the impact of night lighting on the Mauna Kea observatories); and
- the total cost to consumers, rate payers, taxpayers, and utilities of precluding other energy options because of investment in the HGP.

All issues raised in this section will be addressed in the EIS, except as noted below. The EIS will also address other potential socioeconomic issues, including (1) HGP employment-related population changes and subsequent impacts to employment, housing, public services, land use, transportation, and recreation and tourism and (2) the possibility of the HGP providing power for increased urbanization, industrialization, and tourism, and subsequent impacts on population distribution and employment.

The EIS will assess socioeconomic impacts by examining the impacts of

constructing and operating existing geothermal projects, submarine cables, and transmission facilities, as well as other large energy-related facilities, and projecting the HGP's impacts based on experiences in other parts of the world. The socioeconomic impact assessment will rely heavily on data from County planning agencies, the State of Hawaii (including the State's *Energy Functional Plan*) (see Section 4 and Tables 4.1 and 4.2), and geothermal developers.

Some concerns raised by commenters are beyond the scope of the EIS. Issues that will not be addressed in the socioeconomic impact assessment include costs to the State for promoting HGP, the costs of HGP-related litigation, and the political and social conflict generated by the HGP.

3.3.9 Cultural Resources/Native Hawaiian Concerns

Many speakers at the public meetings requested that the EIS consider the Native Hawaiians and their rights, religion, and culture. Many people expressed the belief that the HGP would desecrate the volcano goddess Pele and requested that the EIS examine potential impacts of the HGP on Native Hawaiian lifestyles and cultural and religious practices. A mass mailing concerning this issue is discussed in Appendix A.

Issues identified during scoping include

- potential desecration of Pele, the volcano-nature goddess, and impaired ability to observe Native Hawaiian religious practices associated with Pele; interrupted generational continuity in the training of young persons in traditional religious and cultural practices;
- loss or desecration of religiously, spiritually, culturally, and socially unique habitats, land forms, resources (e.g., archaeological sites and artifacts; atmospheric signs such as rainbows), and species (see Section 3.3.4);
- impediments to religious and other cultural uses of surface and subsurface waters located near the geothermal resource (see Section 3.3.2);
- compliance with the American Indian Religious Freedom Act, the National Historic Preservation Act of 1966, and other pertinent State and Federal legislation (see Tables 4.1 and 4.2);
- confidentiality of Native Hawaiian practices and religiously significant sites, including heiau (sacred sites) and burial sites in caves, cliffs, lava tubes; concern for potential desecration of sites;
- reduced access to traditional coastal trails, healing places, and areas important for subsistence gathering, maricultural development, and medicinal use of plants; loss of ability to exercise gathering, fishing, and water rights;
- reduced contact with and access to marine resources: sanctuaries (coastal caves and heiau), spiritual emanations or hoailona (natural signs) such as waves, subsistence fishing from reefs and nearshore fishing grounds, gathering of limu (seaweed) (see Section 3.3.4.3);
- reduced contact with fish, birds, and other wildlife identified as 'aumakua (deified ancestors); loss of traditions rooted in aloha 'aina (respect and love for the land);
- precluded use of Native Hawaiian homelands and ceded lands; loss of access to or delayed homesteading of such lands (see Section 3.3.6);
- alteration of the traditional rural physical setting and landscape;
- effects of the HGP on the integrity of archaeological resources; potential for increased unauthorized access to archaeological sites and areas important to traditional culture, which could lead to their alteration or destruction;
- potential for damage from submarine cables to submerged archaeological

remains such as nearshore underwater fishing sites;
- loss of racial identity;
- effects on subsistence lifestyles, including degradation of fishponds;
- impact on State constitutional Native Hawaiian legal rights and Common Law rights of 1892;
- impact on Native Hawaiian family and community life;
- impact on intergenerational linkages to ancestral lands and cultural/historic sites; and
- impact on quality of life, changes in mental/cultural health, and impact on Native Hawaiian identity and pride.

The EIS will address all issues raised in this section, except as noted below. Additional comments made by Native Hawaiians suggest that not all Native Hawaiians agree on how these issues should be characterized. For instance, some Native Hawaiians distinguish between worshipping and respecting Pele. They advocate wise use of and protection of natural resources but do not view the HGP as an agent of potential religious desecration.

To assess specific cultural resources and Native Hawaiian concerns, the EIS will employ professional archaeologists to generate predictive models and conduct archaeological surveys in two of the main project areas, the geothermal resource subzones (GRSs) in the Puna District, Hawaii, and the south shore of Maui. The State Historic Preservation Division has identified these areas as being likely to contain previously unidentified cultural resources. Additional reconnaissance and inventory surveys will still be required on affected islands, of Puna GRSs, transmission line corridors and access roads, and land-sea transition points along submarine cable routes. Marine archaeological surveys may be required off the coast of Maui in areas where nearshore underwater fishing sites are suspected. These surveys will be undertaken when and if the proposed project or subsequent projects reach more precise levels of definition than are currently available and would not be done for the EIS.

In addition, the EIS will utilize a Native Hawaiian cultural resource survey that will involve archival research and ethnographic and ethnohistorical description and analysis of those aspects of Native Hawaiian culture covered by this project. Information from these sources is essential in evaluating and describing various claims that sites within the project area are important for the perpetuation of particular traditional practices, and such information will be necessary for predicting the probable distribution of historic sites in the various areas of potential impact. Consultation with Native Hawaiians and the State Historic Preservation Division will provide mechanisms for ensuring that confidentiality of information about religiously and archaeologically significant sites is maintained.

Where appropriate, the EIS will also address impacts to cultural resources not specifically identified as Native Hawaiian. The Hawaii State Historic Preservation Officer, the Office of Hawaiian Affairs, the Office of Hawaiian Home Lands, National Park Service (NPS), and the President's Advisory Council on Historic Preservation will be consulted as important sources of information and guidance in undertaking the required studies. These archaeological and cultural resource surveys will provide the basis for compliance with pertinent Federal legislation, including the National Historic Preservation Act of 1966 (as amended), Sections 106 and 110; the American Indian Religious Freedom Act of 1978 (amendments proposed); and the Native American Graves Protection and Repatriation Act of 1990. If the project would require placement of dredged or fill materials, DOE must also initiate Section 106 coordination with the Archaeological

and Historic Preservation Act of 1974. Pertinent State legislation includes Hawaii State Constitution, Article 12, Section 7; Hawaii Revised Statutes, Chapter 6E; and State Act 306 concerning religious and cultural rights, historic preservation, and protection of burial sites, respectively (see Tables 4.1 and 4.2).

Some aspects of Native Hawaiian issues are beyond the scope of the EIS; these include, for example, the potential loss of racial identity. Other issues will be addressed only to the extent that they relate clearly to impacts generated by the HGP. For example, a compilation of litigation involving Native Hawaiian claims aside from those directly related to the HGP is beyond the scope of the EIS. However, DOE intends to consult and cooperate with Native Hawaiians through mutually recognized expert consultants and Native Hawaiian organizations that represent various Native Hawaiian viewpoints and concerns, including but not limited to Hui Malama I Na Kupuna O'Hawaii Nei. DOE also intends to consult with the Office of Hawaiian Affairs, an agency in Hawaii charged with representing Native Hawaiian interests and managing ceded lands. By establishing these contacts, DOE seeks to ensure that the EIS accurately reflects to the extent practicable the concerns and issues that some Native Hawaiians regard as significant. In addition, DOE will promote wherever possible community access to the results of cultural studies. To the extent possible, consultations on these surveys will extend directly to affected Native Hawaiian communities.

3.3.10 Aesthetic Resources

Commenters stated that the EIS should address the aesthetic impacts of HGP on all islands, including impacts to natural and agricultural landscapes, beaches, and recreation areas. Specific issues that were identified in the scoping process include

- visual impacts of clearing land in the Wao Kele O Puna rain forest;
- visual impacts from vented steam and cooling towers;
- visual impacts of transmission lines, cable facilities, and increased erosion, particularly in established scenic areas, near park and reserve lands, and near recreation areas;
- visual impacts of an industrial facility in a residential and/or rural environment;
- aesthetic impacts to the Puna District and along transmission line corridors because of HGP-related noise, odor, and night lighting, including potential nuisance impacts of noise (see Section 3.3.5);
- proximity of HGP facilities to the Hawaii Volcanoes National Park (HVNP) in consideration of visual impacts (e.g., night lighting), Air-Quality-Related Values under the Clean Air Act, and noise impacts on HVNP's Wilderness Area; and
- visual impacts on the marine environment (e.g., oil slicks, cable presence, and water clarity), including coastal areas.

The EIS will address all issues raised in this section. The EIS will identify and describe important aesthetic resources in the vicinity of HGP plants and transmission facilities and will assess the impacts of the proposed project on those resources. The assessment will include an aesthetic resources survey and analysis and will involve contacting County planning agencies, the State of Hawaii, and citizen groups for information and assistance in preparing the survey and analysis. DOE will consult with NPS planners and managers in Hawaii with regard to the potential for aesthetic impacts in protected areas within HVNP (see Section 4). Aesthetic impacts associated with construction in the marine environment as it affects water quality and marine biota are addressed in Section 3.3.4.3.

3.3.11 Alternatives

Commenters suggested that the alternatives-related issues listed below be addressed in the EIS. All issues raised in this section will be addressed in the EIS, except as noted below.

- the State of Hawaii's preferred alternative of geothermal for the Big Island only initially should be considered;
- commenters requested an examination of conservation and demand-side management (DSM) and renewable energy sources (biomass, solar thermal, wind, etc.) as alternatives to the proposed action;
- concern was raised that if the purpose of the HGP is to reduce the need for imported oil in the transportation sector, then the use of oil in the transportation sector should be examined;
- environmental and economic impacts of geothermal power should be compared with the impacts of other reasonably foreseeable alternatives, including renewable energy sources and coal;
- all alternative strategies should be analyzed in an integrated resource planning (IRP) context, and externalities should be identified and quantified where possible;
- commenters noted that if a geothermal resource of 500 MW(e) exists on the Big Island, then its full development with or without a submarine cable is a reasonably foreseeable consequence, the impacts of which should be assessed;
- effects of increased industrialization of the Big Island as the result of any alternative should be considered;
- alternative power generating strategies need to be characterized for each island where geothermal-derived energy is being planned to be delivered;
- use of coal-fired power generation as an alternative should include an assessment of the potential environmental impacts (air quality and solid wastes);
- concern was raised that proposed coal-burning facilities in Hawaii might use coal mined in a rain forest of another country;
- use of petroleum byproducts (residual oil from petroleum processing for transportation fuels) should be considered for power production on the Island of Oahu for use there and for possible export to the other islands;
- impact assessment of alternatives needs to address fiscal impacts, population distribution, contribution to energy demand, and reliability of resource;
- alternative cable (overland and submarine) routes and technologies should be evaluated in the EIS;
- various HGP designs and configurations, including alternative facility locations, should be considered and should be sited away from residential areas; and
- off-grid electric power systems (e.g., solar hot water, synthetic natural gas/propane for cooking, wind, etc.) should be considered where possible in assessment of alternatives.

From 1985 through 1989, the State had envisioned a large-scale, 500-MW(e) geothermal/inter-island submarine cable project as an alternative means of reducing the State's 90-percent dependence on imported oil for electricity generation. However, as of January 1990, the State has redefined its geothermal goal to a planning level that seeks to have geothermal development first meet the requirements of the Big Island. This downsized project would not include an inter-island submarine cable system. If this goal is successful, only then would the State consider a large-scale geothermal and inter-island cable project.

Alternatives to the proposed DOE action (partially funding Phase 3) and reasonably foreseeable alternatives to the

proposed project (Phase 4, the proposed construction and operation of the HGP) by others will be addressed in the EIS. These alternatives will include the no-action alternative of not providing some Federal funding for Phase 3. In addition, reasonable alternatives to and within the proposed HGP, both supply and non-supply, as well as design and location alternatives, will be considered. The criteria for evaluating alternatives will include and consider the energy objectives and policies cited in 226-18, Hawaii Revised Statutes (HRS), of the Hawaii State Plan.

The HGP will be evaluated to determine which alternatives have the potential to achieve similar objectives. The main emphasis will be in determining the proposed HGP's contribution to meeting power generation needs and Hawaii's energy policy goal of reducing reliance on imported oil. This determination will be based in part on projections of electric generation requirements and plans to meet these requirements. Transportation actions that would potentially reduce dependence on oil will not be considered as alternatives to the proposed action. Although these actions have been mentioned during scoping meetings as possible alternatives because they could potentially accomplish one of the proposed action's primary objectives, (i.e., reduce Hawaii's dependence on imported oil), they do not achieve the crucial HGP objective of supplying electric power. Therefore, this alternative is not considered comparable to the proposed action. The EIS will consider, however, the amount of oil displaced by the use of up to 500 MW(e) of geothermal energy and other supply-demand alternatives.

Alternatives that will be considered include alternative geothermal technologies, sites, and capacities; alternative supply-demand options, such as no-action, geothermal on the Big Island only, and conservation and DSM plus renewable energy supply sources; alternatives associated with the overland transmission routes; and alternative submarine cable routes and technologies. Alternatives to the proposed submarine cable system will include: various cable routes and cable materials, such as solid dielectric or oil-filled submarine cables, operation at either high voltage alternating current (HVAC) or high voltage direct current (HVDC), and alternative methods of land-sea transition. Each of these alternatives will be evaluated based on its economic and technical viability. The potential environmental and economic impacts for each energy supply-demand option will be identified, examined, and compared to the impacts of the proposed action.

3.3.11.1 Alternatives Within the Proposed Project

3.3.11.1.1 Development Scenarios

During scoping, several commenters questioned the need for power-generating capacity where geothermal-derived energy was being planned to be delivered. Because the geothermal resource is not yet commercially defined, various geothermal development scenarios will be proposed using available information on (1) the geothermal resource potential that may be commercially available and (2) the energy demand forecasts provided by the Hawaiian Electric Company (HECO) and its wholly owned subsidiaries the Maui Electric Company (MECO) and the Hawaii Electric Light Company (HELCO). These scenarios will allow for a staged development of geothermal resources to meet the energy demands projected by the utilities.

3.3.11.1.2 Geothermal Technologies

Alternatives within the proposed 500-MW(e) (net) HGP will include various power-generating strategies and power-generating technologies (e.g., total

reinjection and in situ heat exchange). Technology alternatives will be selected from the best available information from the State of Hawaii, geothermal developers, utilities, and other experience with geothermal development.

3.3.11.1.3 Alternative Sites

In response to scoping comments about the location of geothermal facilities, alternative sites will also be considered in the EIS. Because the basis for site selection will be the availability of adequate geothermal resources, the EIS will rely on best available information regarding the development potential of the Kilauea East Rift Zone (KERZ). Geothermal development on Maui will not be included because the resource is not expected to be economical for power generation.

3.3.11.1.4 Overland Transmission Routes

The scoping process identified the need to consider alternative overland transmission routes and technologies. Potential overland routes, based on configurations described previously in HECO (1989), existing overland routes, and discussions with the State and County of Hawaii, will be defined and discussed in the EIS in terms of impacts to land use, ecological resources, health and safety, socioeconomics, cultural resources and Native Hawaiian concerns, and aesthetics.

3.3.11.1.5 Submarine Cable Routes and Technologies

The concerns identified as environmental (see Section 3.3.4.3), socioeconomic and recreational (see Section 3.3.8), and cultural (see Section 3.3.9) regarding the marine environment will be addressed for each of the alternative cable scenarios.

Cable routes. The preferred route is at present only roughly defined. Therefore, factors relating to competing uses, impacts to water quality and marine ecology (particularly to threatened and endangered species), economics, impacts to cultural heritage, and risks of reasonably foreseeable accidents (see Section 3.3.12.2) will be important in defining the preferred routes and viable alternatives.

Alternative cable materials and configurations. When the Hawaii Deep Water Cable Program (HDWC) analyzed the many possible configurations, an oil-filled cable was considered technically and economically the preferred alternative. Those cables that were found to be technically feasible (HDWC 1985a) will be reexamined from an environmental perspective, as will solid dielectric cables, if they are demonstrated to be reasonable from a technical and cost basis.

HVDC vs HVAC transmission. The preferred technological alternative for the submarine cable is HVDC. If HVAC is found to have sufficient technological merit that it can be considered a reasonably foreseeable alternative, then its potential environmental impacts will be considered. Of particular concern is the electromagnetic field (EMF) associated with alternating current (ac), which is considerably greater than that observed for the same power rating with direct current (dc).

Land-sea transitions. Only the potential impacts of alternatives of pumping station/no pumping station and conversion station/no conversion station (if there will be taps for the local system) will be considered. An examination of alternative refinements is not reasonable in the EIS because of insufficient details of proposed pumping or conversion stations.

3.3.11.2 Alternatives to the Proposed Project

3.3.11.2.1 No-Action

The no-action alternative is defined as Hawaii's continued reliance on the existing

and planned power generating mix, which is predominantly oil-fired capacity with some coal-based capacity and renewable energy sources. Using the energy demand scenarios developed by the Hawaiian utilities, the EIS will examine the technical, economic, and reliability aspects of this "business as usual" alternative as well as the potential environmental impacts.

3.3.11.2.2 Alternative Supply-Demand Options

In addition to the no-action alternative, two supply-demand alternatives will be evaluated. The first is the development of increments of up to 500 MW(e) of geothermal energy for use on the Big Island only (no submarine cable). Under this alternative, the State would be expected to continue its support for geothermal development of less than 500 MW(e) until the extent of the resource is known and it can be determined that the environmental and economic impacts of the transmission system are acceptable. By examining this alternative, the EIS will address the scoping concern that if a resource of 500 MW(e) exists on the Big Island, then its development for use on the Big Island only is a reasonably foreseeable consequence. The definition of this alternative will consider utility plans and/or the projected needs for generating power on the Big Island.

A second supply-demand alternative would include conservation and DSM plus a mix of renewable supply alternatives, such as biomass, solar, photovoltaic, geothermal, small-scale hydroelectric, and wind. These supply-demand options will be examined on an island-by-island basis in the framework of IRP. All supply-demand alternatives will be analyzed in the EIS using IRP methods available from Hawaiian utilities as well as from other sources. The extent of the EIS analysis will depend on the availability of credible data from the Hawaiian utilities and from the individual alternative assessments.

The energy supply-demand alternatives will be evaluated by first screening them for technical feasibility (i.e., whether the resource exists and is technically feasible to develop in the same time-frame as the HGP). If the alternative is technically feasible, its potential environmental impacts and economic costs will be evaluated.

The basis of the economic evaluation will be a comparison of the discounted value of the life-cycle costs of geothermal energy to a configuration of alternatives that would provide equivalent power and generation (or an equivalent increase in energy efficiency and DSM) over the assumed lifetime of the geothermal resource. Cost estimates of alternatives will be based on the best available information, with special consideration of cost factors affecting Hawaii.

Reasonable energy alternatives and strategies including conservation/DSM, off-grid electric power systems where possible, renewable energy sources, and alternative geothermal power generating plants will be compared using an IRP framework. This assessment will be conducted using available data and studies from the State, local utilities, and others, and will be coordinated, where possible, with Hawaii's IRP process that is currently under way.

Uncertainty about capital costs, energy costs, economic risks, and environmental factors will be incorporated through sensitivity analyses. Alternatives to the HGP will be evaluated through the simulation of alternative resource plans using utility planning models. The effect of alternatives on Hawaii's dependence on imported oil will also be explicitly examined where possible. This examination will focus on the displacement of imported petroleum for electric power generation, the use of petroleum processing residuals for power production, and the manner in which reductions in the use of oil for electricity production would affect Hawaii's dependence on petroleum imports. The

need for power production facilities will also be evaluated. The effect on environmental resources that are being considered for the proposed action will be considered for viable alternatives.

3.3.12 Reasonably Foreseeable Accidents

All issues raised in this section will be addressed in the EIS.

3.3.12.1 Proposed Geothermal, Geothermal Alternatives, and Overland Transmission Routes

As discussed in Section 3.3.7, commenters expressed concerns about accidents during construction and operation of the HGP plants and transmission facilities. Accidents could result from natural phenomena, such as seismic or volcanic activity, hurricanes, or tsunamis, or from human factors, including operator error or flawed plant design and construction. Specific issues identified during scoping include

- health and safety impacts to workers and the public from accidental releases of hydrogen sulfide (H_2S), radon, heavy metals, and organic compounds emitted into the air, surface water, and groundwater (see Section 3.3.7);
- accidents involving the HGP plants and transmission facilities resulting from volcanic and/or seismic activity;
- impacts to terrestrial and aquatic ecological resources resulting from accidental releases of hazardous materials into the air and water;
- economic impacts of accidents at the plants or along the transmission corridor (e.g., additional project costs for evacuating residents, replacing project facilities, providing reimbursement for damages); and
- impacts to Native Hawaiian cultural practices resulting from accidental releases of hazardous materials into the air and water.

As indicated by these examples, concerns over the potential impacts of accidents have been raised in connection with almost every resource area to be addressed in the HGP EIS. Therefore, most resource areas (meteorology/air quality, surface and groundwater resources, geological resources, ecological resources, health and safety, emergency preparedness, socioeconomics, and cultural resources) will include a discussion of the potential impacts of accidents. However, the primary discussion of impacts related to accidents during HGP construction and operation will be in the section of the EIS that will address reasonably foreseeable accidents.

In addressing accidents, the EIS will use an approach that will assess the consequences of potential accidents, discounted by their probability. Because the area in the vicinity of the proposed HGP is very active geologically, the EIS will assume that important accident initiators are earthquakes and volcanic eruptions. The analysis will further assume that these natural phenomena cause an accident in which (1) the HGP's pipeline/well head connections and automatic shut-off valves fail, leading to uncontrolled venting of geothermal fluid or (2) a blow-out preventer on an HGP well fails, leading to uncontrolled venting of geothermal fluid. For each scenario, the quantities and effects of the primary materials released—H_2S, radon, and toxic heavy metals—will be compared with the quantities and effects of the same materials released through the earth's natural venting process, and the cumulative effects from all sources will be evaluated. Hurricanes and tsunamis also pose a threat to transmission/conversion facilities near coastal areas. Loss of load could result in a period of venting, which may be uncontrolled for some period of time. The EIS will quantify the probabilities

of such accidents based upon the best available information.

3.3.12.2 Submarine Cable and Alternatives

Commenters raised issues about

- numerous hazards on land, in the coastal zone, and at sea with respect to fabrication, transportation, construction, deployment, maintenance, or retrieval operations for the submarine cable;
- cable reliability during extreme events, such as tsunamis, hurricanes, and debris flows or turbidity currents;
- potential of cable break due to mechanical impact (anchor dragging, shark bite, etc.); and
- possible hazards to human health if the EMF from the cable attracts sharks (see also Section 3.3.4.3).

Construction and operation in and near the marine environment involve numerous hazards on land, in the coastal zone, and at sea with respect to fabrication, transportation, construction, deployment, maintenance, and retrieval operations, and these will be addressed. The EIS will address operations in normal sea state and under extreme conditions. The impacts of a cable failure that affect primarily terrestrial systems, such as the community at a geothermal plant site or those relying on the power in Oahu, will be discussed (see also Section 3.3.4.1). The U.S. Geological Survey (USGS) and the U.S. Coast Guard will be consulted about the potential for accidents involving the submarine cable system (see Tables 4.1 and 4.2).

Commenters asked about the ability of the submarine cable system to withstand being hit by anchors, shark bites, or purposeful sabotage. The EIS will examine those concerns using information in the available literature and experiences elsewhere.

Commenters were also concerned that the EMF from the cable would attract sharks. Various experts on sharks will be consulted, and the literature will be carefully reviewed to determine whether attraction of sharks is credible. Shark attraction will be addressed to the extent available information permits.

3.3.13 Federal, State, and Local Government and Geothermal Developers

During the public scoping process, some participants questioned the credibility and neutrality of certain organizations involved in the development of the HGP. This questioning extended to environmental and engineering consultants affiliated with geothermal developers. The public requested that DOE carefully consider the qualifications and integrity of potential subcontractors for environmental support studies associated with the HGP EIS. Specific issues that were identified in the scoping process include

- lack of governmental concern for citizens' rights, health, and welfare;
- denial of due process in HGP-related litigation;
- dismissal of public concerns by government officials;
- collaboration between government and geothermal developers;
- powerlessness of citizens to influence government decisions on the HGP; and
- competence of government employees and geothermal developers.

These concerns are not within the scope of the EIS; however, DOE recognizes the importance of independent oversight and public involvement in activities to build confidence and trust and will continue to make information available to the public and respond to public comments.

As noted in Section 3.2, DOE held ten public scoping meetings (two a day at five locations) and provided a public comment period to accept written comments. Transcripts from these meetings were placed in the HGP EIS reading rooms for public review. In addition, information exchange meetings and meetings with Native Hawaiians were held (see Table 3.1 and Figure 3.1). This Implementation Plan (IP) is being made available for public review and comment. Also, an interactive workshop was held to receive comments and suggestions on the working draft IP from all cooperating agencies. To encourage public involvement, *Federal Register* notices, press releases, and local advertisements have been used to publicize activities. DOE will continue to publicize public participation opportunities. In addition, the Draft EIS will be the subject of public hearings prior to issuance of the Final EIS and Record of Decision (ROD).

3.3.14 Environmental Compliance Regulatory Issues

Commenters thought that the EIS should include a review of all applicable Federal, State, and County rules, regulations, and statutes, including the National Environmental Policy Act (NEPA), Occupational Safety and Health Administration (OSHA) requirements, the National Historic Preservation Act, the American Indian Religious Freedom Act, the Endangered Species Act (including Section 7 consultation), the Public Utilities Regulatory Policy Act, and other legislation (see Tables 4.1 and 4.2). Commenters also thought that the EIS should include a review of regulatory issues in light of the major changes that have occurred during the course of the HGP.

Issues that were identified in the scoping process include

- Federal, State, and County permit compliance;
- effect of past and current litigation on geothermal development;
- apparent violations of environmental laws by geothermal developers;
- inadequate monitoring for compliance with emissions standards; and
- role of State and County enforcement agencies.

All issues raised in this section will be addressed in the EIS. The HGP will be required to comply with all applicable Federal, State, and County regulations and legislation. The EIS will list and describe the Federal, State, and County laws and acts that apply to the HGP and will assess HGP impacts against the standards associated with those laws. For example, the National Ambient Air Quality Standards (NAAQS) and State of Hawaii air quality standards for H_2S will be used in the EIS assessment of HGP air quality impacts. In addition, Mitigation Action Plans, completed in conjunction with the EIS and its ROD, will explain how measures designed to mitigate impacts will be planned and implemented. These Mitigation Action Plans are required by DOE NEPA Implementing Procedures, 57 *Fed. Reg.* 15122 (1992), to be codified at 10 CFR Part 1021.

4. HGP EIS WORK PLAN

4.1 AGENCY CONSULTATIONS

A partial list of agencies expected to be contacted during EIS preparation is given by subject area and agency in Tables 4.1 and 4.2. This list will be revised and expanded as necessary based on recommendations made by various agencies. Appendix B summarizes the comments provided by Federal, State, and County agencies in response to (1) the Advance Notice of Intent (ANOI); (2) the Notice of Intent (NOI); (3) invitations to act as cooperating agencies; and (4) the working draft IP for the HGP EIS.

4.1.1 Cooperating Agencies

As part of the scoping process, DOE selected other Federal agencies, the State of Hawaii, and Counties in Hawaii to participate in EIS preparation as cooperating agencies. Cooperating agency roles and responsibilities in EIS preparation, as defined in Council on Environmental Quality (CEQ) Regulations (40 CFR Part 1501.6), can include participating in the scoping process, developing information, preparing environmental analyses, providing technical reviews, and/or lending staff support. The U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Geological Survey, National Park Service, National Marine Fisheries Service, the State of Hawaii, County of Maui, and County of Hawaii have agreed to be cooperating agencies on the HGP EIS. Memoranda of Understanding have been signed by DOE and each cooperating agency. In addition, FWS, USGS, and COE are being funded by DOE to conduct technical support studies to assist in the preparation of the EIS. Details of the cooperating agency technical support studies are currently under review, but preliminary plans for the studies are discussed in Sections 3.3.1 through 3.3.4.

4.1.2 Other Federal Agencies and Non-Governmental Organizations

While preparing the HGP EIS, DOE will contact and conduct reviews with other Federal agencies and Native Hawaiian organizations. In particular, EIS preparers will contact the U.S. Environmental Protection Agency, U.S. Navy, U.S. Coast Guard, Soil Conservation Service, U.S. Department of the Interior, and U.S. Department of Transportation.

4.2 PREPARERS OF THE EIS

Oak Ridge National Laboratory (ORNL) has been selected by DOE to assist in the preparation of the HGP EIS and to support all EIS procedural requirements. ORNL is assisted by the University of Tennessee in the areas of cultural resources and socioeconomics and by subcontractors with specific expertise. Supporting documentation and data will be provided by Federal, State, and County agencies (especially those identified as cooperating agencies) and others. DOE is responsible for the scope and content of the EIS and supporting documents. NEPA disclosure statements are on file at DOE's Office of Conservation and Renewable Energy, Washington, D.C. Copies of these statements are included in Appendix G.

4.3 SIGNIFICANT EIS MILESTONES

Significant milestones in the preparation of the HGP EIS are shown in Figure 4.1. At this IP stage, the milestones are tentative and subject to change as needed to ensure the preparation of an EIS that meets all applicable requirements.

4.4 RELATED ENVIRONMENTAL DOCUMENTATION

Several Federal and State environmental documents related to geothermal development in Hawaii will be reviewed and used as information sources during HGP EIS preparation. In terms of Federal NEPA documents, EIS preparers will review the U.S. Energy Research and Development Administration's *Environmental Assessment of the Hawaii Geothermal Project Well Flow Test Program* (1976) and DOE's NEPA documentation for HGP-A, *Environmental Assessment, Hydrothermal Geothermal Subprogram, Hawaii Geothermal Research Station, Hawaii County, Hawaii* (1979).

EIS preparers will also review a number of environmental documents prepared by the State of Hawaii. Two early documents, prepared for the Hawaii Department of Planning and Economic Development in

1978, are the *Environmental Impact Statement for the Hawaii Geothermal Research Station Utilizing the HGP-A Well at Puna, Island of Hawaii* and the *Revised Environmental Impact Statement for Hawaii Geothermal Research Station, Island of Hawaii.* DBED's more recent environmental documentation, *Environmental Assessment for the Hawaii Deep Water Cable Program* (1987) and Environmental Review: 500 MW(e) Geothermal Development Within the Three Geothermal Resources Zones of the Kilauea East Rift Zone, Puna District, Island of Hawaii (1989), will also be reviewed during EIS preparation. In addition, EIS preparers will review environmental documentation for other development proposals, including a commercial rocket launching facility (when the document becomes available) and a manganese nodule refining facility on the Big Island, *Final Environmental Impact Statement, Proposed Marine Mineral Lease Sale: Exclusive Economic Zone Adjacent to Hawaii and Johnston Island* (1990).

Several environmental documents related to private geothermal developments on the Big Island have been prepared to date, and some of them have served as State EISs. Those that will be reviewed during HGP EIS preparation include two prepared for True/Mid-Pacific Geothermal Venture: *Revised Environmental Impact Statement for the Kahauale'a Geothermal Project, District of Puna, Island of Hawaii, State of Hawaii* (1982) and *Final Supplemental Environmental Impact Statement to the Revised Environmental Impact Statement for the Kahauale'a Geothermal Project* (1986); and a State environmental document prepared for Thermal Power Company, a private geothermal development group, the 1987 *Environmental Impact Statement: Puna Geothermal Venture Project.*

TABLE 4.1.—*Agency Consultations*

Subject Area	Legislation	Agency
Endangered species	Endangered Species Act of 1973, as amended; state laws	U.S. Fish and Wildlife Service, National Marine Fisheries Service, National Park Service, State agencies
Migratory birds	Migratory Bird Treaty Act	U.S. Fish and Wildlife Service, National Park Service
Archaeological, historical, and cultural resource preservation	*Federal:* National Historic Preservation Act of 1966; Archaeological Resources Protection Act; American Indian Religious Freedom Act; and Native American Graves Protection and Repatriation Act; *State:* Hawai'i State Constitution, Article 12, Section 7; Hawai'ian Historic Preservation Law [Haw. Rev. Stat. 6E-1 (1985)]; Hawai'ian Burial Law [Act 306 (Session Laws 1990)]; *County:* Ordinance No. 1941: "A Bill For An Ordinance Establishing A New Chapter In Title 2 Of The Maui County Code Creating A Cultural Resources Commission; Maui County Code, Title 2: "Administration and Personnel," Chapter 2.88, "Cultural Resources Commission"	Federal agencies, State Historic Preservation Office, President's Advisory Council on Historic Preservation, Native Hawaiian Groups, Office of Hawaiian Affairs, Maui County Cultural Resources Commission, State Department of Hawaiian Home Lands
Discharge of pollutants to water	Clean Water Act; Safe Drinking Water Act	U.S. Environmental Protection Agency, National Marine Fisheries Service, State agencies
Work in navigable waters of the United States	Section 404 of Clean Water Act; Section 10 of Rivers and Harbors Act	Corps of Engineers, National Marine Fisheries Service

TABLE 4.1.—*Agency Consultations*
(continued)

Subject Area	Legislation	Agency
Prime and unique farmlands	Farmland Protection Policy Act of 1981	Soil Conservation Service
Floodplains	Executive Order 11988	Federal agencies, State agencies
Wetlands	Executive Order 11990; Fish and Wildlife Coordination Act; Section 404 of Clean Water Act	Corps of Engineers, U.S. Fish and Wildlife Service, State agencies, U.S. Environmental Protection Agency
Water body alteration	Fish and Wildlife Coordination Act, Section 10 of Rivers and Harbors Act, Section 404 of Clean Water Act	U.S. Fish and Wildlife Service, National Marine Fisheries Service, State agencies, Corps of Engineers
River status	Wild and Scenic Rivers Act; Anadromous Fish Conservation Act; Hanford Reach Study Act	U.S. Department of the Interior
Air pollution	Clean Air Act	U.S. Environmental Protection Agency, National Park Service, State and local agencies
Water use and availability	Water Resources Planning Act of 1965; Safe Drinking Water Act; Primary and Secondary Drinking Water Standards; others	U.S. Environmental Protection Agency, Office of Water Policy, State agencies

TABLE 4.1.—*Agency Consultations*
(continued)

Subject Area	Legislation	Agency
Noise	Noise Pollution and Abatement Act of 1970; Noise Control Act of 1972	U.S. Environmental Protection Agency, National Park Service, State agencies
Siting and planning	State and County legislation	State and County agencies
Waste management and transportation	Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act and the Hazardous and Solid Waste Amendments of 1984; Comprehensive Environmental Response, Compensation and Liability Act; Emergency Planning and Community Right to Know Act	U.S. Environmental Protection Agency, U.S. Department of Transportation, State agencies
Coastal zones	Coastal Zone Management Act; State and County legislation	Office of State Planning, County Planning Department

TABLE 4.2.—*Government Agency Permit Consultation List*

Permit Abbreviation	Permit Title or Type	Cross-Reference to Related Permits/Permits Delegated to Other Agencies
	State of Hawaii Department of Land and Natural Resources	
DLNR 1	Ocean Waters Construction Permit	NOAA 1, CG 1, CG 2
DLNR 4	Forest Reserve Special Use Permit	
DLNR 5	Forest Reserve Access Permit	
DLNR 6	Entrance to Wildlife Sanctuary	
DLNR 7	Transporting Permit	
DLNR 8	Permit to Enter Closed Watershed	
DLNR 9	Natural Area Reserve Special Use Permit	
DLNR 10	Historic Preservation Review	COE 1, COE 5
DLNR 11	Use of State Land Including Submerged State Lands	NOAA 1, CG 1, CG 2
DLNR 12	Conservation District Use Application	
DLNR 13	Water Use Permit Within Water Management Areas	
DLNR 14	Stream Channel Alteration Permit	
DLNR 15	Stream Diversion Works Construction or Alteration Permit	
DLNR 16	Well Construction or Pump Installation Permit	
DLNR 17	Geothermal Resource Mining Lease	

TABLE 4.2.—*Government Agency Permit Consultation List*
(continued)

Permit Abbreviation	Permit Title or Type	Cross-Reference to Related Permits/Permits Delegated to Other Agencies
DLNR 18	Dams and Reservoirs Construction Approval	COE 2
DLNR 19	Geothermal Exploration Permit	
DLNR 20	Geothermal Resource Subzone Designation	
DLNR 21	Geothermal Plan of Operations	
DLNR 22	Geothermal Well Drilling or Modification Permit	
	State of Hawaii Department of Health	
DOH 1	Notification of Hazardous Waste Activity	EPA 1
DOH 2	Hazardous Waste Treatment, Storage and Disposal (TSD) Permit	EPA 1
DOH 3	Underground Storage Tank (UST)	
DOH 4	Underground Injection Control (UIC) Permit	EPA 3
DOH 5	Water Quality Certification (WQC) Army Corps of Engineers Section 401 Permit	
DOH 6	Authority to Construct (ATC) a Potential Air Pollution Source	EPA 2
DOH 7	Permit to Operate (PTO) a Potential Air Pollution Source	EPA 2
DOH 8	Prevention of Significant Deterioration (PSD)	EPA 2

TABLE 4.2.—*Government Agency Permit Consultation List*
(continued)

Permit Abbreviation	Permit Title or Type	Cross-Reference to Related Permits/Permits Delegated to Other Agencies
DOH 9	Community Noise Permit for Construction Activities	
	State of Hawaii Department of Business, Economic Development and Tourism	
DBEDT 1	District Boundary Amendment	
DBEDT 2	Land Use Commission Special Use Permit	
	State of Hawaii Office of State Planning	
OSP 1	Federal Consistency With the Hawaii Coastal Zone Management Program	COE 5
	State of Hawaii Department of Transportation	
DOT 1	Permit to Perform Work on State Highways	FHA 1
	Hawaii County	
HC 1	Geothermal Resource Permit (GRP)	
HC 2	Special Management Area (SMA)	
HC 3	Shoreline Setback Variance (SSV)	
HC 4	Special Permits	
HC 5	Use Permits	
HC 6	Subdivision of Land	
HC 7	Plan Approval	

TABLE 4.2.—*Government Agency Permit Consultation List*
(continued)

Permit Abbreviation	Permit Title or Type	Cross-Reference to Related Permits/Permits Delegated to Other Agencies
HC 8	Grubbing, Grading, Excavation and Stockpiling Permits	
HC 9	Excavation of Public Highways	
HC 10	Installation of Utilities Within Federal and Secondary County Highways	
HC 11	National Flood Insurance	
HC 12	Building Permits	
HC 13	Outdoor Lighting Permit	
HC 14	Electrical and Plumbing Permits	
HC 15	Sign Permit	
HC 16	Building Plan Approval	
	Maui County	
MC 1	Department of Public Works Construction Permits	
MC 3	Land Use Commission Special Use Permit	DBEDT 2
MC 5	Shoreline Setback Variance	
MC 6	Special Management Area Use Permits	
	City and County of Honolulu	
CCH 1	Conditional Use Permit-Type 1	

TABLE 4.2.—*Government Agency Permit Consultation List*
(continued)

Permit Abbreviation	Permit Title or Type	Cross-Reference to Related Permits/Permits Delegated to Other Agencies
CCH 2	Special Management Area Use Permit (SMP)	
CCH 3	Shoreline Setback Variance	
	U.S. Navy	
NAV 1	Notification Regarding Surface and Subsurface Plans	
	U.S. Army Corps of Engineers	
COE 1	Permits Under Sections 9 and 10 of the Rivers and Harbors Act of 1899 for Structures or Works in or Affecting Navigable Waters of the United States	NMFS 2, OSP 1
COE 2	Permits Under Section 103 of the Marine Protection Research and Sanctuaries Act of 1972 for Ocean Dumping of Dredged Material	FWS 1, NMFS 7, EPA 4, OSP 1
COE 3, 4, and 5	COE 3: Permits Under Sections 404 of the Federal Water Pollution Control Act of 1972 and Amendments for Discharges or Dredged or Fill Material into Waters of the United States; COE 4: Water Quality Certification from the State of Hawaii Department of Health; COE 5: Coastal Zone Management Consistency Certification from the State of Hawaii The Corps permit may also involve consultation with applicable agencies on endangered species and historic sites.	EPA 1, FWS 2, NMFS 1, OSP 1, DOH 5

TABLE 4.2.—*Government Agency Permit Consultation List*
(continued)

Permit Abbreviation	Permit Title or Type	Cross-Reference to Related Permits/Permits Delegated to Other Agencies
	National Oceanic & Atmospheric Administration	
NOAA 1	Notification to Charting and Geodetic Services	CG 1
	Department of Transportation, U.S. Coast Guard	
CG 1	Notification of Submerged Cable	NOAA 1
CG 2	Notification of Cable Laying Operations or Related Projects	
	U.S. Fish and Wildlife	
FWS 1	Endangered Species Act Activities Review	COE 2, NMFS 6
FWS 2	Clean Water Act Review	EPA 1, DOH 5, COE 3, NMFS 1
FWS 3	Rivers and Harbors Act Review	COE 1, NMFS 2
FWS 4	Fish and Wildlife Coordination Act Review	NMFS 9
	National Marine Fisheries Service	
NMFS 1	Clean Water Act Section 404 Permit Application Review	FWS 2, COE 3
NMFS 2	Rivers and Harbors Act of 1899 Section 10 Permit Application Review	COE 1

TABLE 4.2.—*Government Agency Permit Consultation List*
(continued)

Permit Abbreviation	Permit Title or Type	Cross-Reference to Related Permits/Permits Delegated to Other Agencies
NMFS 3	Clean Water Act Section 401, Water Quality Certification Application Review	COE 4, FWS 2, EPA 1
NMFS 4	Federal Coastal Zone Management Consistency Determination Review	OSP 1, COE 5
NMFS 5	Marine Mammal Protection Act (MMPA) Exemption	
NMFS 6	The Endangered Species Act (ESA) Section 7, Consultation Process	FWS 1
NMFS 7	Marine Protection Research and Sanctuaries Act of 1972, Section 103 Permit Review	COE 2
NMFS 8	National Environmental Policy Act, EIS preparation and review	
NMFS 9	Fish and Wildlife Coordination Act	FWS 4
	U.S. Environmental Protection Agency	
EPA 1	Permits and Licenses Under Section 402 of the Federal Water Pollution Control Act of 1972 and Amendments	DOH 1, DOH 2, FWS 2, COE 3
EPA 2	Permits and Licenses Under the Clean Air Act	DOH 6, DOH 7, DOH 8
EPA 3	Underground Injection Control (UIC) Permit	DOH 6
EPA 4	Ocean dumping permits under Sect. 102(a) of the Marine Protection Research and Sanctuaries Act of 1972	COE 2

TABLE 4.2.—*Government Agency Permit Consultation List*
(continued)

Permit Abbreviation	Permit Title or Type	Cross-Reference to Related Permits/Permits Delegated to Other Agencies
	Federal Highway Administration	
FHA 1	Approval for Work to be Performed on Interstate Highway	DOT 1

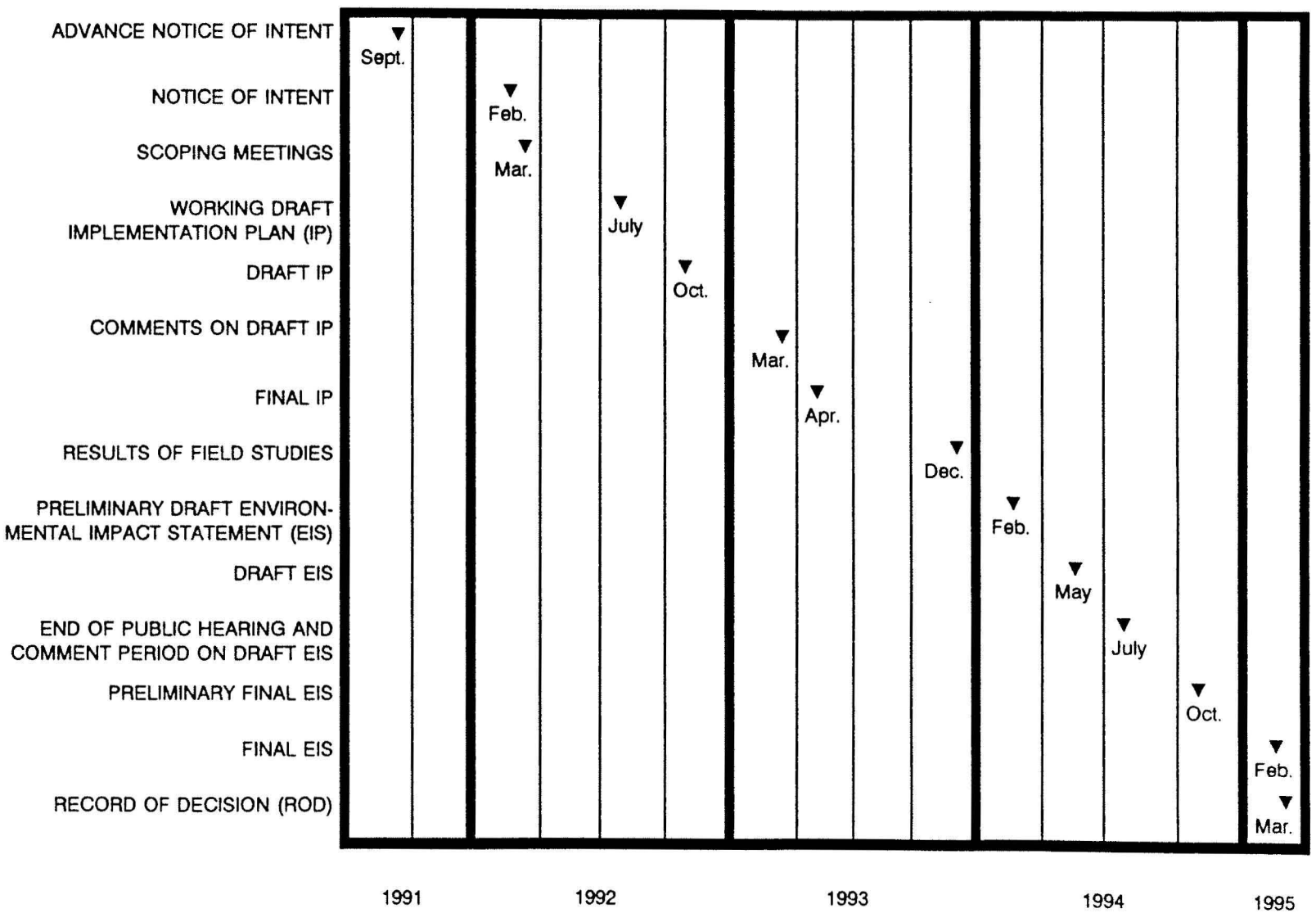

Figure 4.1. HGP EIS milestones.

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APPENDIX A

SUMMARY OF ORAL AND WRITTEN SCOPING COMMENTS

CONTENTS

1. INTRODUCTION

This appendix contains a summary of the oral and written comments received during the scoping process for the Hawaii Geothermal Project (HGP) Environmental Impact Statement (EIS). The summary provides an overview of the issues that have been suggested for inclusion in the HGP EIS, with equal consideration given to both oral and written comments.

Oral comments were presented during public scoping meetings. Written comments were solicited (1) at the public scoping meetings; (2) in the Advance Notice of Intent (56 *Fed. Reg.* No. 170, 43585–87) and Notice of Intent (57 *Fed. Reg.* No. 31, 5433–37) to prepare the HGP EIS; and (3) in project-related correspondence and meetings (e.g., cooperating agency meetings).

Listed in the table below are the ten public scoping meetings (one afternoon, one evening) that the Department of Energy (DOE) held at five locations in Hawaii. These meetings were held in compliance with Council on Environmental Quality regulations (40 CFR Part 1501.7) and DOE National Environmental Policy Act (NEPA) Guidelines (subsequently superseded by DOE regulations implementing NEPA (10 CFR Part 1021). Also, DOE policy is to facilitate opportunities for public involvement in the NEPA process. Accordingly, the purpose of these meetings was to ensure adequate opportunity for public and government agency participation in developing the EIS scope by identifying the issues to be addressed, commenting on the proposed action, and suggesting alternatives to be analyzed.

One-hundred seventy individuals provided more than 700 comments during scoping meetings (see Figure A-1), and 70 individuals submitted written materials and letters to DOE during the scoping period. In addition, scoping inputs obtained from public comment letters and discussions with federal, State, and County agencies through August 1992 (Appendix B) were considered in the preparation of this IP. The majority of comments came from individuals, but about 50 organizations (including environmental, public interest, and community groups) also participated by offering comments through representatives. Additionally, 242 people submitted a "clip

HGP EIS public scoping meetings in Hawaii

Location	Date
Pahoa (Big Island)	March 7, 1992
Wailuku (Maui)	March 9, 1992
Kaunakakai (Molokai)	March 12, 1992
Honolulu (Oahu)	March 14, 1992
Kamuela/Waimea (Big Island)	March 16, 1992

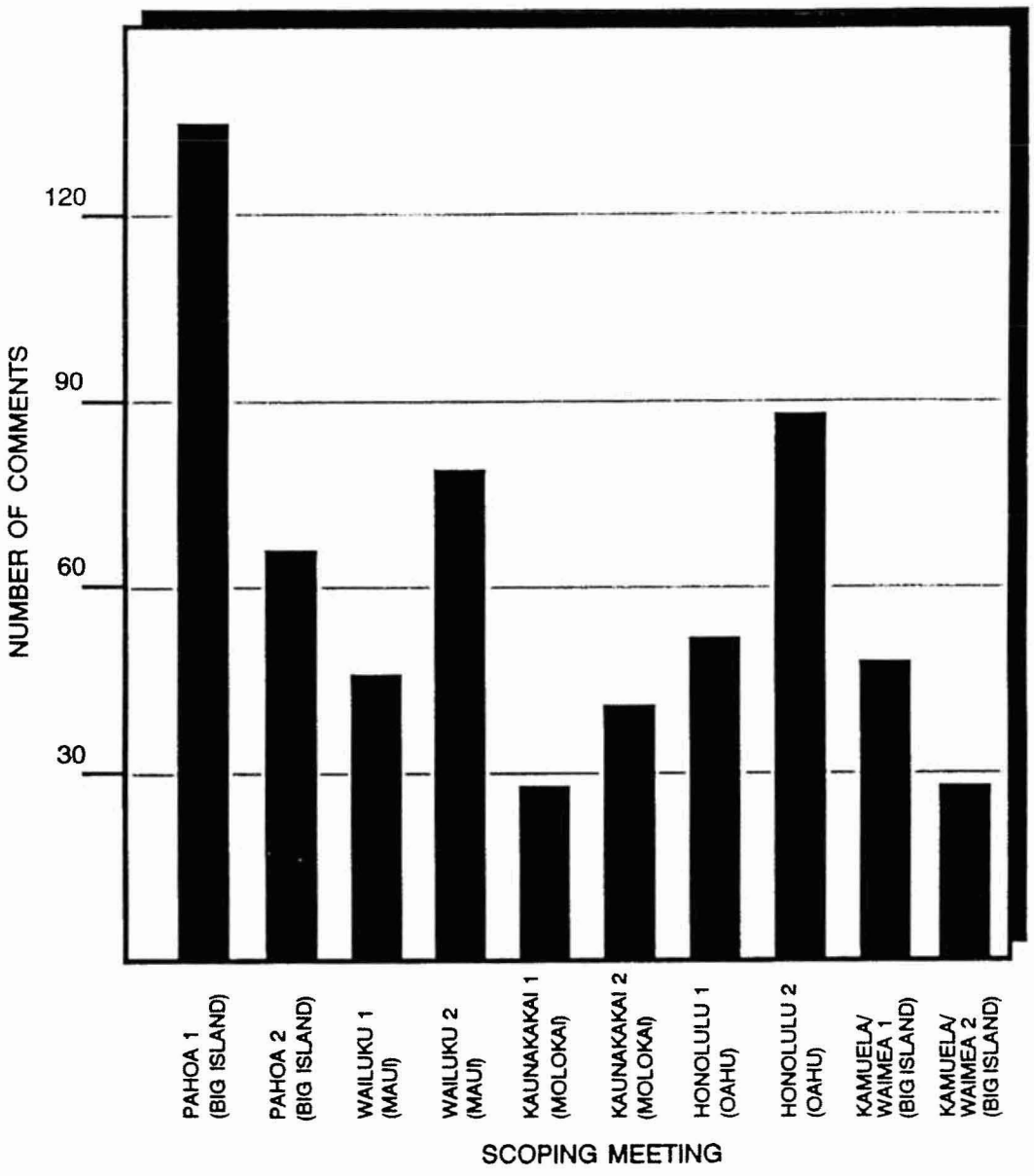

Figure A.1. Number of oral scoping comments at the ten public scoping meetings for the HGP EIS. More than 700 comments were offered.

and ship" coupon that states, "I support your efforts to evaluate the cultural and religious implications of geothermal development in Hawaii with your current EIS process. Please recognize that serious consideration must be given to the alternatives to geothermal because the cultural impacts of this energy development cannot be mitigated. I expect your EIS to reflect this conclusion." An offer to be on DOE's HGP Mailing List was sent to commenters who signed these coupons. All scoping comments submitted by federal, State, and County agencies are summarized in Appendix B of this IP, but the issues

raised in those submissions are also included in this summary.

During the scoping meetings, a court recorder transcribed all oral comments; the transcripts may be reviewed at DOE Reading Rooms (see Attachment 1 to this appendix) and at locations identified in the *Federal Register* notices. The transcripts give the name of each speaker. Authors of written submissions are given alphabetically by individual and organization in Attachment 2 to this appendix.

Oral and written scoping comments were reviewed and analyzed. Issues raised by the commenters were categorized by subject area and counted (see Figure A-2).

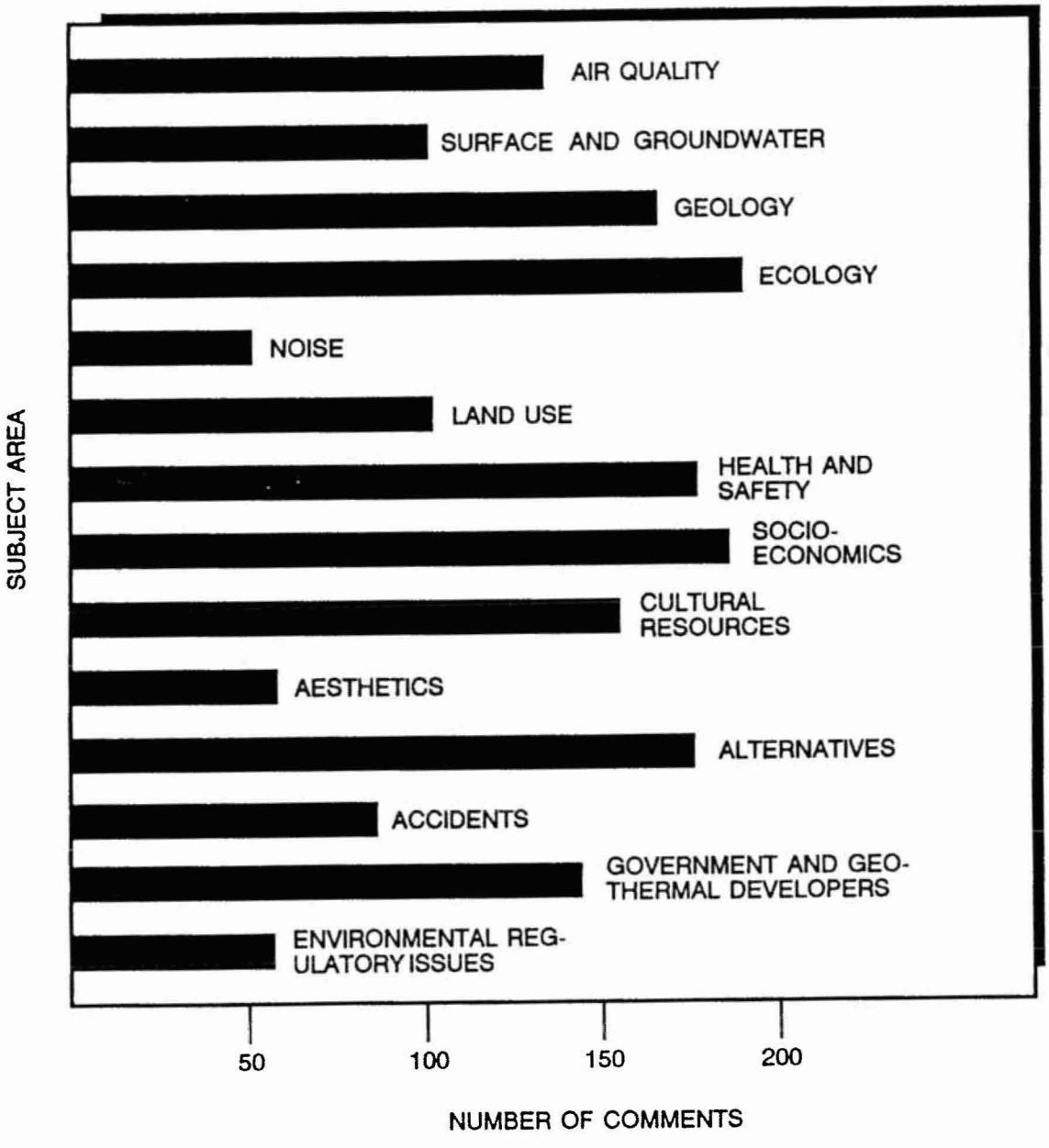

Figure A.2. Number of oral and written scoping comments by subject area. About 1800 comments were received.

2. COMMENT SUMMARIES

2.1 PURPOSE AND NEED FOR STATE ACTION

Several commenters suggested that the EIS state whether the HGP will achieve the goals of the State for the HGP: to alleviate Hawaii's dependence on imported fuels and to develop indigenous, cost-effective, renewable energy supply options for the State's future energy needs.

Commenters suggested that if additional energy or energy self-sufficiency were very important, then serious attempts at conservation would have been made, and laws requiring solar hot-water heating on State buildings or new homes would be enacted.

In questioning the objectives of the HGP, commenters noted that planning for the development of 500 MW(e) of geothermal power places substantial reliance on a single source of power with a high potential for failure either in the power supply or cable.

Many noted that the bulk of the crude oil used in Hawaii is used for transportation and that electricity is generated using the residuals. Therefore, unless the need for petroleum products for transportation were reduced, geothermal power would not in any meaningful way reduce the State's dependence on imported oil. If tourism is increased because of increased power availability, tourism's reliance on oil for transportation may increase Hawaii's dependency on oil.

2.2 GENERAL ISSUES REGARDING THE PROPOSED ACTION

2.2.1 Project Definition

Some commenters wanted a better definition of both phases of the HGP, believing that the EIS should clearly delineate the federal and State's participation in the HGP. It was noted that for 500 MW(e) to reach Oahu, more power must be generated at the source. The proposed action should be defined from inception through decommissioning and rehabilitation, including locations of power plants, well heads, transmission corridors, campsites, access roads, other infrastructure and aircraft used for surveillance. The number of wells for exploration, source, and reinjection should be estimated and the acreage required to support them for the lifetime of the plant. Estimates of the number of wells that need to be drilled to result in the requisite number for source and reinjection should be based on prior experience in Puna and around the world.

Because the wells for HGP are so close to sites of recent and on-going volcanic eruption, commenters also indicated that the EIS should discuss the idea that the infrastructure associated with the wells will be portable.

2.2.2 Mitigation Methods

Commenters requested that the proposed and alternative abatement and mitigation measures be described and their potential impacts identified and assessed, including best available control technologies, measures to prevent invasion of non-native species, reforestation techniques (i.e., reforest, restock with biota, etc.), and disposal of hazardous waste. Backup measures should be included. The EIS should state how implementation of monitoring, mitigation, and enforcement measures identified by the document will be guaranteed.

2.2.3 Cumulative Impacts

The commenters were concerned about whether the impacts of prior and on-going geothermal development would be considered in the EIS. There was considerable skepticism about past and

present geothermal development and developers (suggesting that the many failures are due to improper operation). Others noted that geothermal energy has been successful elsewhere. Commenters mentioned the effects that have already occurred in the Puna district: health effects, both physical and psychological (due to geothermal emissions and noise), and impacts to agriculture, livestock, and other plants, animals, and birds both in and out of the Wao Kele O Puna rain forest. Some residents were forced to leave their homes during recent venting incidents. The presenters also noted lowered property values and that community and individual rights have been violated.

Commenters felt that the EIS should assure that incidents, such as those that occurred at Puna Geothermal Ventures (PGV) in 1991, do not occur with the HGP, noting that PGV is a small-scale operation relative to HGP. This would require reviewing previous incidents and implementing the recommendations of the expert review team. The commenters expressed concern that, to date, geothermal developers have not provided citizens with accurate information concerning their operations and releases.

The presenters also noted that environmental examination of geothermal development to date has been segmented, inadequate, and performed using a very limited data base and perspective. Some prior environmental compliance documents did not address the reasonably foreseeable consequences of a successful project, were inadequate, and conditions for operation and mitigation were not followed.

2.2.4 Resource Surveys

A number of studies of the affected environment were suggested, including characterization of the affected environment (including socioeconomics), groundwater, the hydrology and geology of the Kilauea East Rift Zone (KERZ), local meteorology, natural (ambient) emissions, and geothermal emissions, fluids, and solid wastes. Commenters indicated that surveys of the biota in the KERZ region and all the proposed overland and undersea transmission corridors should be carried out; archaeological sites on the southeastern coast of Maui should be analyzed.

2.3 POTENTIAL ENVIRONMENTAL ISSUES

Commenters thought the EIS should fully evaluate the short- and long-term environmental, social, and economic costs and benefits of the HGP, (including wells, support structures, transmission lines/submarine cable, pumping stations, campsites, access roads, and aircraft used for maintenance reconnaissance), particularly to pristine environments such as the Wao Kele O Puna rain forest, the southeast coast and Hana districts of Maui, much of Molokai, and the marine environment. Commenters asked that the EIS consider not only local impacts but also planetary or global considerations. The preparers of the EIS should consider the fact that the Hawaiian islands are finite, and consider, therefore, if the HGP is consistent with this limitation on growth.

Commenters expressed a general requirement to protect the land and its biota as a responsibility of those living on it. Commenters noted that when assessing the impacts of the HGP, there should be no artificial separation of humans from the environment.

DOE should perform the environmental studies necessary to provide the scientific data required to weigh the costs and benefits of the HGP and should make the information available to the public. However, the commenter noted that studies that would be intrusive should not be performed. Commenters indicated that the EIS should clearly state information gaps and their significance. When measurements

(for monitoring or other purposes) are taken, they should be performed by analysts with appropriate expertise and at appropriate locations.

A number of issues raised apply to many of the categories below. For example, commenters felt that the EIS should identify and assess (1) chronic effects of HGP-related high- and low-level emissions, effluents, noise, and night light on plants, animals, birds, and insects, in the wild, in the rain forest, on agricultural lands, and on humans (see Health and Safety); (2) impacts of the HGP on plants and animals used for medicinal and ritual purposes by Native Hawaiians (EIS should also address the impacts of the loss of benefits of these plants); and (3) impacts of the HGP on plants, animals, birds, and fish used for subsistence living. In addition, commenters indicated that the EIS should describe measures that would be used to assure that herbicides used to prevent invasion of non-native plant species will affect only target species. It should demonstrate that these mitigation measures will be carried out and how they will be enforced. Herbicides so used can impact terrestrial and aquatic biota within or outside the rain forest, including threatened and endangered species. They can enter the human food chain in drinking water, air, or food.

Many of the presenters were concerned that acid rain or fog that may occur as a result of geothermal development, could impact air, water, and soil quality, terrestrial and land-based aquatic ecosystems, and have significant socioeconomic effects. Additional concerns were that emissions would cause acid rain resulting in excessive corrosion of piping or building materials or that emissions would discolor or erode paint, etc.

Commenters asked that the EIS establish whether the clearing of land for the HGP would exacerbate erosion affecting air and soil quality and terrestrial and aquatic land-based ecosystems. Increased erosion could cause increased siltation and turbidity, potentially impacting the near-shore environment including fishponds and fisheries, reefs, and tourism (economic, cultural, and archaeological concerns).

2.3.1 Air Quality

Several commenters recommended that the EIS characterize the emissions associated with the 500-MW(e) development and identify the impacts of those emissions, including toxic releases, acid rain or fog, and thermal pollution, and particles from solid wastes. Certain atmospheric conditions were reported to exacerbate the effects of HGP-related emissions in Puna and even degrade the air quality on Maui and Molokai. Geothermal emissions can affect the water quality in catchment systems, commonly used in Puna for drinking and bathing.

2.3.2 Surface and Groundwater Resources

Commenters recommended that the EIS characterize the effluents and the brine ponds associated with the 500-MW(e) development. The EIS should report the impacts of leakage of source and injection wells into aquifers due to well failure (from seismic/volcanic events or corrosion) or leakage/overflow from the brine ponds. Commenters want the EIS to address impacts of the HGP on drinking water quality (particularly in water catchments) and on surface or groundwaters, considering the effects of possible contact with HGP-related solid wastes, abatement technologies, or their possible failures, and changing the water quality designation of aquifers in the geothermal subzone.

2.3.3 Geologic Issues

The commenters expressed concern that undertaking geothermal development in a seismically and volcanically active zone may exacerbate those activities and upset the hydrological balance as the development will be situated on a geological structure that contains numerous vertical dikes, faults, and horizontal shelves. The EIS should examine geothermal-associated subsidence.

Commenters also said that the EIS should discuss the reliability of the geothermal power generation facility and associated infrastructure, noting mistakes that had been made in the past. Those concerned about the reliability of the geothermal facilities mentioned the potential hazards of locating such plants (and transmission lines) in an active seismic/volcanic zone, of isolation from the base load (both at the facility and to the users), of irreparable wells, and of uncontrolled and unabated blowouts. They were concerned about the integrity of well casings and the possibility that brine ponds might overflow during heavy rains or leak due to the corrosive nature, high temperature, and high pressure of the geothermal fluids. Others were concerned about availability of water for quenching.

Thus, commenters want the EIS to identify and assess potential impacts of failure modes. It should examine the unique geological system with which the HGP will interact, examining the potential for seismic/volcanic events interconnecting aquifers resulting in contamination.

Some commenters believe the EIS should identify and assess the impacts associated with the need for stand-by backup power for those using the geothermal power in order to maintain system reliability.

Other commenters were concerned that the magnitude of the resource in the KERZ has not been verified. The EIS should discuss the reliability and renewability of the resource. The EIS should investigate the effect of the need for expansion into additional land as the resource declines.

2.3.4 Ecological Resources

Many commenters asked that the EIS examine the project's impact on the unique ecosystems that make up Hawaii, including plants, vertebrates, and invertebrates. Many of the concerns raised could be applied to several ecosystems: terrestrial, aquatic, or marine ecosystems and the threatened, endangered, and endemic species therein and on humans.

Terrestrial Resources

Several commenters recommended that the EIS should address the potential impacts of the HGP on unique species (e.g., insects that live in lava tubes). Other commenters expressed particular concern for the rain forest. They felt that the EIS should identify and assess the impacts of the HGP (particularly in terms of species diversity and its ability to regenerate), including the effects of introduction of non-native species, extensive segmentation caused by building roads and clearing areas, and incursions of humans. Commenters also indicated that the EIS should study the impacts of destroying the unique and fragile habitat of the Wao Kele O Puna rain forest. It should note the interrelationship between the lava, the biota of the region, and the regeneration that occurs following an eruption.

Impacts to wetlands, cave ecosystems, birds, invertebrates, and ethnobotanical and medicinal species were also cited as concerns. The use of herbicides and invasion by non-native species were regarded as important issues.

One commenter was concerned that the construction of the HGP would start a series of complex changes in the lowland

rain forest ecosystem. He stated that the "long-term longitudinal study" necessary to understand this effect would be difficult to conduct for the EIS, making it equally difficult, if not impossible, to predict the consequences of those changes. Thus, the EIS should assess the risks of making a complex environmental decision without information regarding the impacts.

Some commenters were concerned about the potential impacts of the HGP on threatened, endangered, and endemic species, particularly in the rain forest of Puna and the dry forest on Maui. Species mentioned include ohia, happy-face spider, Hawaiian hawk, and hapu'u (tree fern). Commenters thought the EIS should consider that, because of the unusual geology in Hawaii (criss-crossing lava flows on all islands), very small areas of unique habitat exist that support the few remaining individuals of an endangered species that are evolving at different rates.

One commenter asked what happens if species become extinct as a result of the HGP.

Aquatic Resources

Commenters identified several issues concerning aquatic resources in streams, springs, and anchialine ponds: land-based freshwater and brackish-water ecosystems, potential impacts from groundwater changes that result from reinjection, effects on aquatic flora and fauna as a result of any HGP-induced surface water changes. Potential impacts to threatened and endangered species were also mentioned several times.

Marine Resources

Commenters requested that the EIS investigate the impacts of the submarine cable installation and maintenance (increased turbidity, possible ciguatera, and increased noise levels), normal operation (electromagnetic fields, electrotaxis), and in failure modes (such as oil leakage) on the ocean and its resources, including marine mammals, sea turtles, big game fish, dolphins, food stocks, sharks, rays, and skates; on beaches, surfing locations, and reefs; and on ecology in the coastal zone.

Commenters noted that the EIS should investigate the impacts of the cable on humpback whale migration patterns, birth rate, ability to navigate and locate, and the potential impacts of nets (used to protect swimmers if the submarine cable attracts sharks) on humpback whales' birthing habits in shallow, protected waters. Commenters also asked that the EIS investigate the impacts the HGP would have on fisheries and consider the impacts of the cable (e.g., installation, operation, maintenance) on the reefs and fish ponds.

2.3.5 Noise

Commenters indicated that the EIS should address the impacts of noise associated with geothermal development, including drilling, operations at and near the geothermal facility under normal operating conditions, and with unscheduled venting. Impacts would also occur along transmission lines, at work camps or substations, and due to aircraft (doing maintenance reconnaissance). They noted that noise can cause ear damage, fear, loss of sleep, and psychological stress.

2.3.6 Land Use

Commenters recommended that the EIS consider the propriety of (1) geothermal development in the residential neighborhoods of Puna, noting that blowouts occur at most geothermal installations world-wide; (2) using Native Hawaiian homelands, ceded lands, and conservation districts for the HGP, even though some of those lands are not currently being developed because they

have no supporting infrastructure; and (3) the land exchange in Puna (Campbell Estate for Wao Kele O Puna), and subsequent redesignation as a geothermal subzone to determine whether it has benefitted Native Hawaiians. The commenter noted that there are already long waiting lists for resettlement of those lands, and using some for the HGP may exacerbate the situation.

Commenters also requested that the EIS address the impacts of the HGP on water availability and water uses to determine if there is sufficient water within the Kilauea system to support the HGP and provide for other uses. In addition, fire hazards associated with the transmission line system exacerbated by drought conditions were mentioned. Commenters noted that the EIS should address the impacts of the absence of registration of geothermal wells as water wells, as some Native Hawaiians have claimed water use rights for the subsurface waters in the Puna district.

Several commenters asked that the EIS consider impacts of the HGP on aviation, communication, agriculture, and recreational uses, for example, in the rain forest and on beaches. Further, the EIS should examine how the possibility of geothermal development has influenced land ownership and land-use decisions.

2.3.7 Health and Safety

Commenters indicated that the EIS should assess the health and safety impacts of the HGP and its components, failures, mitigation measures, and future uses.

Several commenters expressed concerns about the potential health effects of geothermal emissions [particularly hydrogen sulfide (H_2S) and acid rain] and effluents, due to HGP-related changes in air, drinking water, and food quality. These effects can include eye, throat, and nose irritation, breathing trouble, coughing, wheezing, and lowered resistance to infection. Those presenting were concerned about the cumulative and synergistic effects of emissions, effluents, and brine ponds, on children and babies, those with respiratory ailments, the elderly, Native Hawaiians, and workers. The EIS should analyze the short- and long-term chronic and acute effects of geothermal emissions on public health and safety.

Some commenters indicated that the EIS should examine the health and safety impacts of the transmission line/underwater cable system (including transformers), particularly the effects of electromagnetic fields and stray voltage along the transmission line corridor, or ciguatera associated with cable construction in the near-shore environment.

The commenters recommended that the EIS address psychological impacts of the HGP and its associated development, including impacts of stress due to fear, unannounced venting, and sleep deprivation (due to noise, fear, frustration, and lack of trust) and the problem of the fears of geothermal development that exist in the surrounding communities due to the prior activities in the region. They asked what the psychological impacts are on a community experiencing controversy, lack of empowerment, and loss of due process. The EIS should consider psychological impacts on persons whose lifestyle had been disrupted (e.g., children and Native Hawaiians) and cross-cultural psychological issues.

With respect to geothermal developments in residential areas, the commenters strongly urged that the EIS should develop a worst-case scenario for the full development and, noting that there is no adequate emergency response plan for the Puna District, develop one. Residents are concerned about impacts of isolation of the facility from the base load, which could result in unabated and/or uncontrolled venting. The transmission lines would

parallel the Kea'au road, which is also the evacuation route from Pahoa. If a seismic or volcanic event occurred along that road, the facility could be isolated from its base load, and the community would be prevented from evacuating. They also mentioned inadequate communication systems.

Some commenters thought that the EIS should address the impacts of the violence that might occur should the HGP proceed.

With respect to the submarine cable, commenters asked that the EIS state what steps will be taken to protect the public and the cable if it attracts sharks, consider the implications of possible sabotage to the cable, and address the risks of accidents during maritime operations in the Alenuihaha Channel. They noted that the EIS should consider the civil defense issue of a major segment of power generation capacity being linked by such a transmission connection to its load.

Commenters indicated that the EIS should identify and assess the hazards of overland transmission lines, including the potential of increased fire danger and electrical hazards associated with high-voltage lines. Some commenters noted that the EIS analysis should consider the fact that the HGP may cause increased population that would (along with drought conditions which do occur on the Big Island) further exacerbate the problems mentioned above.

2.3.8 Socioeconomics

Many commenters expressed concern about the long- and short-term socioeconomic impacts of the HGP. Several commenters, for example, expressed economic concerns. They asked that the EIS delineate the costs (past, present, and future) of the entire HGP project to consumers, users and non-users, taxpayers, and utilities, from inception through decommissioning and rehabilitation, including all State and federal developmental and court costs, and costs for publicity, etc., drilling and wells, building new ships, harbors, and the cable, etc., mitigation, and rehabilitation, and monitoring and enforcement. It should examine the economic feasibility and cost-effectiveness of HGP. Commenters also requested that the EIS consider the cost of cable or facility failure once geothermal energy provides a significant proportion of Hawaii's energy needs, including the costs associated with a declining resource, of repair, and of development of backup capacity. Some commenters asked that the EIS identify who would be responsible for the consequences of lower property values or property condemnation.

Several commenters noted that the EIS should (1) address the economic impacts should the submarine cable affect fisheries (including fishponds), big game fish and food stocks, or tourism; (2) evaluate the impacts of the HGP (and the effects of its presence making large regions of the State less desirable for living) in terms of lower property values (including condemnation), increased cost of living, etc., loss of crops or livestock, increased depreciation (e.g., of fences, houses, and catchment systems) due to geothermal-related corrosion; (3) examine the economic impacts of geological risks and hazards, the impact of the indebtedness incurred; (4) consider impacts to businesses (including agriculture), such as job loss, business relocation, or loss of business; and (5) assess impacts to local economies.

Additionally, some commenters requested that the EIS identify who is liable—the federal government, the State, and/or privately-owned corporations—for all costs incurred and mandate that conditions of permits should include future liability clauses. Commenters felt that the EIS should identify means to provide insurance for those whose property values (etc.)

decline or are forced to move due to the HGP.

Some commenters asked that the EIS consider the impacts of diverting funds that could be spent on conservation technologies to the geothermal effort, and one commenter noted that investment in conservation has resulted in changing patterns of investment toward technologies that reduce the need for energy consumption. Investment in conservation technologies saves the costs of constructing and updating additional generation/ transmission facilities.

Commenters further indicated that the EIS should state what the economic benefits of the HGP are, identify who receives them, and weigh the potential benefits of the HGP against the environmental costs. The commenters wanted to assure that consumers and tax payers receive some of the benefits. The presenters would like the EIS to address the concern that those who will bear the greatest cost in terms of health and safety, economics, cultural resources, and environmental losses, will not be the ones to benefit.

Lifestyle issues were also raised by commenters. The EIS should address impacts of the HGP on the lifestyles of the general population, specifically on Native Hawaiians. They asked if the cable/ transmission lines will affect, for instance, subsistence lifestyles, the ability to access beaches, and the lifestyles of those who prefer privacy, peace and quiet, or lower levels of population, technology, or development (e.g., off-grid living).

Commenters felt that the EIS should address the social effects of the HGP, or its failure, particularly on communities near the geothermal operations and along proposed cable routes, including the social consequences of increased cost of living due to the HGP. It should identify and assess the socioeconomic costs due to a decline in resource after the HGP has stimulated growth and evaluate the social costs of HGP-related civil disobedience. One commenter noted that Hawaii, which has largely service-related jobs, has a low unemployment rate, whereas industrialized regions of the country are where the high unemployment occurs.

Several commenters indicated that the EIS should assess potential impacts to the many important, and often undocumented, archaeological and historical sites and regions, including the southeast coast of Maui, the south coast of Molokai, and North Kohala.

Commenters suggested that the EIS identify and assess the potential impacts of the future uses of geothermal energy on all islands affected: increased greater urbanization, growth, industrialization, and development that could include seabed mining and refining, construction of a space port, and increased tourism with associated golf courses and energy-intensive hotels. It should examine negative impacts on the infrastructure, overpopulation, crime, or social upheaval.

Some commenters were concerned that increased power availability could cause increased population and power consumption. They noted that increased tourism could result in increased use of fuels for transportation, thereby increasing Hawaii's dependence on oil.

It was noted that once the submarine cable is in place, other power generation facilities can use the cable as a conduit; in fact, laying of the cable could make construction of other energy-production facilities economically feasible.

2.3.9 Cultural Resources/Native Hawaiian Concerns

Many commenters thought that the EIS should respect Native Hawaiian race, rights, religion, history, language, and culture. Many expressed the belief that geothermal

development would result in the desecration of Pele. They asked that the EIS examine potential impacts of the HGP on Native Hawaiian culture and religious beliefs; the ability of Native Hawaiian practitioners to obtain herbs, animals, and birds necessary for medicinal and ritual practices; Hawaiian homelands or ceded lands (noting that Native Hawaiians have a right and spiritual need to be able to return to their homelands and live their chosen lifestyle); Native Hawaiian subsistence hunting, fishing, and gathering; and the land, ocean, and natural phenomena considered sacred. They expressed concern that HGP construction will result in desecration of ancient or modern Hawaiian burials in lava tubes, heiau (sacred places or shrines), and other places sacred to Native Hawaiians. Many commenters asked that the EIS consider that, for Native Hawaiians, the cultural impacts of the HGP could result in psychological stress, feeling of loss of self, and breakdown of the ohana (extended family).

Commenters further requested that the EIS address the anthropological impacts of the HGP. One commenter recommended that the study be designed by trained anthropologists and should involve personal interviews with practitioners, Hawaiian kupuna (Native elders), and Hula dancers, in order to investigate the impact the HGP would have on cultural practices.

2.3.10 Aesthetic Resources

Commenters wanted the EIS to address the aesthetic impacts of HGP-related noise, visual disturbances, and odors. Although noise is primarily a Health and Safety Issue, it is also an aesthetics issue as it is a nuisance, disrupting peace and quiet. Commenters want the EIS to address the impacts of chronic exposure to nuisance levels of noise associated with geothermal development, including drilling, operation and venting, and transmission lines.

Commenters expressed concern about the aesthetic costs of the HGP (particularly the impacts of the overland transmission lines and clearing the Wao Kele O Puna rain forest) on all islands, including impacts to natural and agricultural landscapes, beaches, and surfing spots. One commenter mentioned the problems of night-time lighting.

2.3.11 Alternatives

Many commenters stated that the EIS should identify and assess the relative merits and impacts of alternative energy supply options that are cost-effective, viable and safe, and could meet the goals of the State's stated purpose for the HGP. They asked that the EIS examine technical and economic feasibility/reliability and environmental impacts of such alternatives. These include "no action," fossil fuel options (coal gasification), conservation and renewables, and various geothermal options. Commenters indicated that alternatives should be considered within the framework of integrated resource planning (IRP) and least-cost planning of supply- and demand-side energy options as this may provide a lower-cost energy supply than geothermal in terms of both economic and environmental cost. They noted that the State is initiating such a process (but it may not be completed within the proposed time frame of the EIS).

Commenters stated that the EIS should examine conservation and renewable energy-supply options, such as photovoltaics, solar thermal (particularly solar hot water heating), wind, ocean thermal energy conversion, biomass, demand-side options (conservation/energy efficiency, passive solar), off-grid options, and others. Many believe that alternative energy options can meet the needs of the State, if the alternative energy supply options could be helped by tax-incentives and low-cost loans. They noted that wind, solar, and biomass are successful elsewhere

and that most islands have excellent wind and solar resources.

With respect to geothermal alternatives, commenters wanted the EIS to assess a staged development of the HGP so that experience is gained with the least capital costs, the possibility of closed-cycle geothermal using immediate reinjection, insitu heat exchange, and geothermal development at locations other than the Kilauea East Rift Zone (KERZ).

If a low level of geothermal development is successful, then greater development of up to, or even greater than, 500 MW(e) becomes a reasonably foreseeable scenario. One comment noted that if geothermal development is successful at the 25-MW(e) level, then it would not be economical or politically astute to limit development to that low level on the Big Island or (if sufficient resource is verified) to the Big Island. Several commenters wanted the EIS to look at the impacts of developing the full resource and all its potential uses.

Commenters asked that alternatives to transmission lines be considered including "no action," solid rather than oil-filled cables, high-voltage ac transmissions vs high-voltage dc transmission, and various cable/transmission line routes (above ground vs buried, percentage of lines on land vs submarine). A number of alternative routes were suggested, including an alternative to the route along the southeastern coast of Maui: North Kohala to Lanai with spur lines to Lahaina and Molokai and direct lines from Lanai to Oahu; or routing the cable directly to Oahu, not landing on Maui. Several commenters further indicated that the EIS should consider the costs (including indirect costs, such as impacts to property values and aesthetic impacts) of above- and underground transmission lines. This could be necessary on a district-by-district basis, given the variable geology of the state. Before development of the HGP and cable, a smaller demonstration should be conducted to determine whether power transmission to other islands is reasonable.

Commenters requested that the EIS examine reducing Hawaii's dependence on petroleum-based fuels for transportation (e.g., using fuel-efficient automobiles) in order to reduce Hawaii's dependence on imported oil. For this reason, commenters requested that the EIS examine the potential contributions of alternative transportation fuels, providing on-site or near-site employee housing, alternative methods for interisland travel. However, a commenter suggested that the EIS should examine the costs associated with supplying an "unneeded" mass transit system on Oahu to save energy.

Some commenters asked that the EIS identify and assess the impacts of fossil-fuel-fired operations, particularly the obtaining of foreign coal. The EIS should address the issue of fossil-fuel power generation adversely impacting air quality and potentially contributing to global climate change. The proposed coal-burning facilities may use coal derived from strip mining a rain forest in a third-world nation. The commenter implied that there are international implications of asking third-world nations to cease cutting their rain forests and then economically encouraging them to clear those forests.

2.3.12 Reasonably Foreseeable Accidents

Commenters expressed concerns about accidents during construction and operation of the HGP plant and transmission line. Accidents could result from natural phenomena, such as seismic or volcanic activity, or from human factors, including operator error or flawed plant design and construction. Specific concerns identified included health and safety impacts to workers and the public from accidental releases of H_2S, radon, heavy metals, and other gaseous and particulate emissions into

the air, surface water, and groundwater; accidents involving the HGP plant and transmission facilities resulting from volcanic and/or seismic activity; impacts to ecological resources as a result of accidental releases; economic impacts of accidents; and impacts of accidents on Native Hawaiian cultural practices.

2.3.13 Federal, State, and Local Government and Geothermal Developers

Many commenters expressed political concerns of one kind or another, noting their frustration with the political process. These comments related to a lack of concern by government, loss of due process because of government regulations and actions, loss of faith in government, lack of necessary expertise within government, and skepticism regarding motives and resolve of government. The commenters mentioned infringement on privacy due to the actions of geothermal developers' security personnel, insufficient public review, and inadequate distribution of information.

Commenters also questioned why the State does not wait until the IRP process is over to develop geothermal and why some solar installations are not already required.

Some commenters believe that State/federal governments should enforce the laws currently in existence (including permitting and monitoring requirements). They noted that the State has never set air quality standards for H_2S. They asked if regulations have been violated in the past, are they currently being violated and will they be in the future?

Some commenters additionally asked that the EIS consider the international implications of the messages conveyed by the United States to the international community, noting that U.S. actions, far more than words, help establish global policy. Thus, the EIS should address concerns about the example it sets for the global community when the United States permits cutting of the rain forest for the purpose of power generation (when it asks that other nations not cut theirs) and does not show respect for the cultural and ethnic resources of its citizens (i.e., Native Hawaiians).

2.3.14 Environmental Compliance Regulatory Issues

Commenters stated that the EIS should contain a review of all applicable rules, regulations, and statutes, including NEPA, the National Historical Preservation Act, the Native American Religious Freedom Act, the Endangered Species Act, Section 7 consultation and the Public Utilities Regulatory Policy Act of 1978.

Commenters also requested that the EIS address the need for geothermal wells to be registered as water wells based on the definition of a water well in the State Water Code, and they noted that the EIS should examine the complex regulatory situation with respect to land use and geothermal subzone designation.

ATTACHMENT 1 — DOE Reading Rooms with Copies of the HGP EIS Public Scoping Meeting Transcripts

This list is an updated version of the list given in the *Federal Register* notices (Appendix F).

Hawaii

Hawaii Energy Extension Service
Hawaii Business Center
99 Aupuni Street, Room 214
Hilo, HI 96720
Contact: Andrea Beck
Telephone: (808) 933-4558
Fax: (808) 933-4602

Hilo Public Library
300 Waianuenue Avenue
Hilo, HI 96721-0647
Contact: Claudine Fujii
Telephone: (808) 935-5407
Fax: (808) 933-4658

Kailua-Kona Public Library
75-138 Hualalai Road
Kailua-Kona, HI 96740
Contact: Irene Horvath
Telephone: (808) 329-2196
Fax: (808) 326-4115

Mountain View Public and School Library
Highway 11
Mountain View, HI 96771
Contact: Evelyn Garbo
Telephone: (808) 968-6300
Fax: (808) 968-6056

Pahala Public and School Library
Pakalana Street
Pahala, HI 96777
Contact: Lisa Cabudol
Telephone: (808) 928-8032
Fax: (808) 928-6199

Pahoa Public and School Library
15-3038 Puna Road
Pahoa, HI 96778
Contact: Laura Ashton
Telephone: (808) 965-8574
Fax: (808) 965-7170

State of Hawaii
Department of Business, Economic Development & Tourism
Hilo Office
99 Aupuni Street, Room 212
Hilo, HI 96720
Contact: Michelle Wong-Wilson
Telephone: (808) 933-4600
Fax: (808) 933-4602

Kauai

Kauai Office of Economic Development
4444 Rice Street, Room 230
Lihue, HI 96766
Contact: Glenn Sato
Telephone: (808) 245-7305
Fax: (808) 245-6479

Lihue Public Library
4391-A Rice Street
Lihue, HI 96766
Contact: Karen Ikemoto
Telephone: (808) 245-3617
Fax: (808) 246-0519

Lanai

Lanai Public and School Library
Fraser Avenue
P O Box A-149
Lanai City, HI 96763
Contact: Peggy Fink
Telephone: (808) 565-6996
Fax: (808) 565-6171

Maui

Hana Public and School Library
Hana Highway
Hana, HI 96713
Contact: Jeremy Kindred
Telephone: (808) 248-7714
Fax: (808) 248-7438

Kahului Public Library
90 School Street
Kahului, HI 96732
Contact: Lani Scott
Telephone: (808) 877-5048
Fax: (808) 871-9032

Maui Planning Department
Energy Division
250 South High Street
Wailuku, HI 96793
Contact: Kalvin Kobayashi
Telephone: (808) 243-7832
Fax: (808) 243-7634

Molokai

Molokai Public Library
Ala Maloma Street
Kaunakakai, HI 96748
Contact: Sri Tencate
Telephone: (808) 553-5483
Fax: (808) 553-5958

Oahu

Hawaii State Library, Document Center
Unit, 634 Pensacola Street
Honolulu, HI 96814
Telephone: (808) 586-3535
Fax: (808) 586-3584

Kahuku Public and School Library
56490 Kam Highway
Kahuku, HI 96731
Contact: Jean Okimoto
Telephone: (808) 293-9275
Fax: (808) 293-5115

Pearl City Public Library
1138 Waimano Home Road
Pearl City, HI 96782
Contact: Marilyn Van Gieson
Telephone: (808) 455-4134
Fax: (808) 456-4407

State of Hawaii, Department of Business,
Economic Development & Tourism
Energy Division, Publications Section
335 Merchant Street, Room 110
Honolulu, HI 96813
Contact: Maurice Kaya
Telephone: (808) 547-3800
Fax: (808) 587-3820

State of Hawaii
Department of Business, Economic
Development & Tourism
Geothermal Office
Financial Plaza of the Pacific
130 Merchant Street, Suite 1060
Honolulu, HI 96813
Contact: Dean Nakano
Telephone: (808) 586-2353
Fax: (808) 586-2536

State of Hawaii
Department of Business, Economic
Development & Tourism
Information Office
220 South King Street, Suite 1100
Honolulu, HI 96813
Contact: Marsha Anderson
Telephone: (808) 586-2405 or 586-2406
Fax: (808) 586-2427

State of Hawaii
Department of Business, Economic
Development & Tourism, Library
220 South King Street, Fourth Floor
Honolulu, HI 96804
Contact: Anthony Oliver
Telephone: (808) 586-2425
Fax: (808) 586-2452

U.S. Department of Energy
Pacific Site Office
Prince Kuhio Building
Room 4322
300 Ala Moana Boulevard
Honolulu, HI 96813
Contact: Eilieen Yoshinaka
Telephone: (808) 541-2563
Fax: (808) 541-2562

Waimanalo Public and School Library
41-1320 Kalanianaole Highway
Waimanalo, HI 96795
Contact: Nina O'Donnell
Telephone: (808) 259-9925
Fax: (808) 259-8209

Mainland

U.S. Department of Energy
Freedom of Information Public
Reading Room, Room 1E 190
1000 Independence Avenue, SW
Washington, DC 20585
Contact: Ed McGinnis
Telephone: (202) 586-6020
Fax: (202) 586-0575

U.S. Department of Energy
San Francisco Field Office Public
Reading Room
1333 Broadway
Oakland, CA 94612
Contact: Estella Angel
Telephone: (510) 273-4428
Fax: (510) 273-6316

ATTACHMENT 2 — Individuals and Organizations That Submitted Written Scoping Comments

When submitting written comments, some commenters failed to sign their submissions or to include any indication of the source of information provided. An attempt has been made, however, to acknowledge receipt of all written comments and to accurately summarize those comments regardless of their source. In addition, although the scoping period began on September 3, 1991 (with the publication of the Advance Notice of Intent), and ended on April 15, 1992 (comment deadline given in the Notice of Intent), some submissions were received outside of this period. For the Implementation Plan, comments received as late as August 30, 1992, were considered as part of scoping.

Scoping comments from federal agencies, State of Hawaii agencies, and Hawaii Counties are summarized by agency in Appendix B.

A city and state is given for each commenter if known.

Individuals

Don Abdul, Hilo, HI
Matthew K. Adolpho, Ho'olehua, HI
Thomas Aitken, Pahoa, HI
William and Rose Atkins, Pahoa, HI
Mary Jo Bafile, Pahoa, HI
Bonnie P. Bator, Kurtistown, HI
Robert Bethea, Hilo, HI
D. Hunter Beyer, Volcano, HI
Ian Bowman, Honolulu, HI
Burton Brees, Pahoa, HI
John A. Broussard, Kawaihae, HI
Cindy Bryan, Pahoa, HI
Janie Bryan, Kaunakakai, HI
Suzanne Ely Byrne, Hilo, HI
David A. Caccia, Honokaa, HI
Eleanor J. Cate, Hilo, HI
Sharon A. Clark, Honolulu, HI
L.A. Collins, Pahoa, HI
Sidney William Cook, Kamuela, HI
Pam J. Cooper, Pahoa, HI
John E. Crawford, Carson City, NV
John M. Davis, Mountain View, HI
Steve and Diane Davis, Pahoa, HI
Carla Deicke, Honolulu, HI
Leana Dumag, Kaunakakai, HI
Kaleoaloha English, Kaunakakai, HI
Sahoni English, Kaunakakai, HI
R. Ann Ernst, Pahoa, HI
Eileen Fiorentino, Kurtistown, HI
Denise Fleming, Keaau, HI
Ole Fulks, Keaau, HI
Brent Gallagher, Kurtistown, HI
Henry Gluckstern, Maplewood, NJ
Dave Gomes, Hilo, HI
Maja B. Gossom, Pahoa, HI
Regina Gregory, Honolulu, HI
Mary Groode, Kihei, HI
Kamuela Hamakua, Kaunakakai, HI
Robert A. Hamburg, Honolulu, HI
Lisa Hamilton, Hana, HI
Eric Hill, Honolulu, HI
Katherine Holford, Santee, CA
Brad Houser, Kailua-Kona, HI
Francis Howarth, Honolulu, HI
Albert Ia-ea, Kaunakakai, HI
Robert Kai Irwin, Honolulu, HI
Robert Jacobson and Julie Hedgecock-Jacobson, Kurtistown, HI
Luana Jones, Pahoa, HI
Cynthia K. Kanoholani, Honolulu, HI
Mahealani Kawikuamookekuaokalani-Henry, Pohoiki, HI
Kekau
Andrew C. Kier, Pahoa, HI
Pat Kikukawa, Kaunakakai, HI
Rona Lee Kleiman, Pahoa, HI

Fred J. Koehenen, Hilo, HI
Steven Krawn, Pahoa, HI
Charles Lamoureux, Honolulu, HI
Anne Lee, Hilo, HI
Randy Lee, Pahoa, HI
Stephen Lewis, Pahoa, HI
Aileen Lum, Hilo, HI
Dan and Lydia Makuakane, Pahoa, HI
Malia
Kalai Malin, Kaunakakai, HI
Penny Rawlins-Martin, Kaunakakai, HI
Carl and Carlyle Meierdiercks, Pahoa, HI
William Merwin, Haiku, HI
Mildred Mims, Pepeekeo, HI
Peter R. Ministero, Pahoa, HI
Robert Mowris, Berkeley, CA
Kevin E. O'Connell, Pahoa, HI
Noreen Parks, Keaau, HI
Gregory Pommerenk, Pahoa, HI
Kilia Purdy, Kaunakakai, HI
Jan L. Reichelderfer, Kailua, HI
Clement Reyes Jr., Kaunakakai, HI
Herbert M. Ritke, Pahoa, HI
Henry Ross, Kapaau, HI
Terri Scott, Kurtistown, HI
Dennis Sevilla, Honomu, HI
Christiane Schafer, Ho'olehua, HI
Penny Shaver, Pahoa, HI
Joseph Shaver, Pahoa, HI
Stephanie Shelofsky, Pahoa, HI
Megan Simpson, Redway, CA
Rene Siracusa, Pahoa, HI
Dian Smith, Pahoa, HI
William D. Smith, Wailuku, HI
Jim Snyder, Hilo, HI
Sean Stehura, Keaau, HI
Elizabeth Ann Stone, Naalehu, HI
Alice Suncloud, Pahoa, HI
Sarah Sykes, Kaunakakai, HI
Dr. Donald Thomas, Volcano, HI
Kalai Ualin
Bettie Van Overbeke, Pahoa, HI
Mr. and Mrs. Arlan Vierra, Keaau, HI
Pat Wilde, APO Area Pacific
James V. Williamson, Kihei, HI
Janice Ola Wilson, Pahoa, HI

Organizations

Aina Realty, Pahoa, HI; Francois L'Orange
AT&T, Morristown, NJ; Eric S. Wagner
BHP Petroleum, Pacific Resources, Honolulu, HI
Big Island Papaya Growers Association, Pahoa, HI; Delan Perry
Big Island Rainforest Action Group, Pahoa, HI; Russel Ruderman
Blue Ocean Preservation Society, Haiku, HI; Carl Freedman
Campbell Estate, Honolulu, HI; Clint Churchill
Citizens Advocating Responsible Education, Honolulu, HI; Wally Bachman, Science Advisor
Citizens for Responsible Energy Development, Mountain View, HI; Earl Dunn
Darby & Associates, Kailua, HI; Ron Darby
ECO Productions, Honolulu, HI; Dr. Sheila Laffey
Environmental Hawaii, Kailua, HI; Patricia Tummons
FB&D Technologies, Inc., Houston, TX; Alan Parolini
Global Environmental, Sacramento, CA; James A. Roberts
Goddard and Goddard Engineering, Lucerne, CA; Wilson Goddard
Greenpeace Hawaii, Hilo, HI; Denver Leaman
Greenpeace and the Rainforest Action Network, Honolulu, HI; Annie Szvetecz
Hana Community Association, Hana, HI; Dawn Lono
Hawaii Community College, Hilo, HI; Fred D. Stone
Hawaii County Economic Opportunity Council, Hilo, HI; Max Goldberger
Hawaii County Energy Advisory Commission, Hilo, HI; Francis Pachecho
Hawaii-La'i'ei Kawaii Assoc., Ka'awala, HI; Jim Anthony
Hawaii Island Geothermal Alliance, Hilo, HI; June Curtiss, Randolph Ahuna

Hawaii Speleological Survey, Hilo, HI; William R. Halliday
Hawaiian Dredging & Construction Co., Honolulu, HI; Frank A. McHale
Hawaiian Electric Company, Inc., Honolulu, HI; Dan Williamson, George T. Iwahiro, Executive Director
International Longshoremen and Warehouse Workers, Local 142, Hilo, HI; Fred Gladones
Ka Lahui Hawaii O'ahu, Honolulu, HI; Ao'pohaku Rodenhurst
Kanoelehua Industrial Area Assoc., Hilo, HI; Randolph Ahuna
Kapoho Community Association, Pahoa, HI; Barbara Bell, Jane Hedtke, Jennifer Perry
Kipahulu Community Assoc., Hana, HI; Rich Von Wellsheim
Kohala Ranch Property Owners Assoc., Kawaihae, HI; Kelley Pomeroy
Kona Palisades Estate Community Association, Kailua-Kona, HI; Roy Mushrush
Lani Puna Gardens Assoc., Pahoa, HI; Aurora Martinovich
Los Alamos Science Student Program, Los Alamos, NM; Alverton A. Elliot
Malu Aina Center for Non-violent Education Action, Kurtistown, HI; Jim Albertini
Maui Tomorrow, Wailuku, HI; Anthony Ranken
Mid-Pacific Geothermal, Inc., Honolulu, HI; Rod Moss
Molokai Cares, Kaunakakai, HI; Lyn S. and William Bonk, Crystal Egusa
National Speleological Society, Huntsville, AL; John P. Scheltens
Native Hawaiian Advisory Council, Honolulu, HI; Elizabeth Pa-Martin
Native Hawaiian Legal Corporation, Honolulu, HI; Paul F. N. Lucas, Staff Attorney
Natural Resources Defense Council, Honolulu, HI; Clyde S. Murley
Northwest Economic Associates, Vancouver, WA; Robert McKusick
Oceanic Cablevision, Honolulu, HI; Don E. Carroll
Orchidland Community Assoc., Keaau, HI; Sherri Moore
Pele Defense Fund, Volcano, HI; Ralph Palikapu Dedman, Emmett Aluli
Progressive Economic Alliance Cultivating Energy, Kula, HI; Paul J. von Hartmann
Puna Advisory Council, Pahoa, HI; Toby Hazel
Puna Community Council, Keaau, HI; Ed Clark, William B. Snorgrass
Puna Geothermal Venture, Hilo, HI; Steve Morris, Maurice A. Richard
Puna Orchards, Inc., Pahoa, HI; Gary W. Barnett, V.P. & Manager
R.A. Patterson & Associates, Kailua, HI; Ralph A. Patterson
Rainforest Action Network, Honolulu, HI; Annie Szvetecz
Sane Assessment of Geothermal Energy, Wailuku, HI; Stephen Moser
Sierra Club of Hawaii, Honolulu, HI; Scott Derrickson, Energy Affairs Advisor, Nelson Ho
Sierra Club Legal Defense Fund, Honolulu, HI; Paul P. Spaulding III
State Senator Andrew Levin; Honolulu, HI
State Senator Rich Reed; Honolulu, HI
State Senator Richard Matsuura; Hilo, HI
Stryker Werner Associates, Inc., Honolulu, HI; Karlton Tomomitsu
True Geothermal Energy Co., Honolulu, HI; Alan Kawada
University of Hawaii, Honolulu, HI; Hawaii Natural Energy Inst., Harry Olson, Don Thomas, Gary McMurtry
West Hawaii Sierra Club, Kailua-Kona, HI; Jay Hanson

Videos

Several videos were submitted by commenters. These are

- "No on Geothermal—The People's Decision," Pan Productions, Maui, Hawaii, 1990, submitted by Mary Groode. The video provides a general introduction to geothermal development in Hawaii; describes opposition to geothermal development; identifies opponents' major concerns (i.e., health effects and impacts to the rain forest).
- "Pele's Appeal," "Bulldozers in Paradise," "Geothermal: A Risky Business," and "Heated Issue." These videos identify the major concerns of opponents to geothermal as being the destruction of the rain forest, potential health impacts to nearby residents, and the desecration of Pele; they also document opposition to geothermal development with footage of protest rallies and pickets.
- MacNeil-Lehrer news hour report on HGP, broadcast January 14, 1992, on PBS.

APPENDIX B

SUMMARY OF FEDERAL, STATE, AND COUNTY AGENCY WRITTEN SCOPING COMMENTS

This appendix summarizes written scoping comments that were received from federal, State, and County agencies concerning the Hawaii Geothermal Project (HGP) Environmental Impact Statement (EIS).

COUNTY AGENCIES

County of Hawaii

In a March 6, 1992, letter accepting cooperating agency status and in an August 3, 1992, review of the working draft Implementation Plan (IP), the County of Hawaii requested that the following issues be considered in the EIS:

Socioeconomics. Impacts of industrialization of the Island of Hawaii (resulting from geothermal development and power availability) should be investigated in the EIS. An analysis of project costs should include consideration of relocating nearby residents and insurance costs during construction and operation. Utility rates with geothermal development should be compared to rates from alternatives.

Air Quality. The EIS should assess air quality effects of venting during power outages (grid failure) and consider problems associated with fixed monitoring systems.

Health and Safety. The EIS should consider effects from hydrogen sulfide (H_2S) and other pollutants at various concentrations and from possible synergistic effects of pollutants.

Ecological Resources. Impacts of emissions on species other than humans should be considered.

Water Resources. The "fate" (i.e., migration) of reinjected fluids and the impacts thereof should be examined in the EIS. Sources and amounts of well-quenching water should be identified.

Land Use. The EIS should assess impacts of incompatible land uses.

Policy. Federal liability in federally funded projects should be discussed.

Other. The EIS should investigate the interconnection of the Island grid and the interisland grid and discuss priorities under various load-shedding scenarios.

County of Maui

In letters of October 1, 1991, and April 13, 1992, and in responses to the working draft IP, the County of Maui requested that the EIS consider all potential impacts associated with the overland transmission corridor, including possible effects on land use, ecological resources, water resources, scenic resources, cultural and archaeological resources, health and safety, particularly as related to the electromagnetic field, and economic issues, particularly effects on property values. If cable landing on Lanai is a reasonable alternative, the EIS should consider these issues as they relate to Lanai.

The EIS should consider the underwater cable's potential economic, cultural, archaeological, and ecological impacts on the reef and fishpond resources along the south shore of Molokai. Lastly, the EIS should reflect recommendations made in the community plans.

STATE AGENCIES

State of Hawaii

The State of Hawaii offered comments in response to the Advance Notice of Intent (ANOI), the Notice of Intent (NOI), the invitation to become a cooperating agency, and in reviewing the working draft IP. The communications are from the Office of State Planning, the Department of Business and Economic Development, the Office of Hawaiian Affairs, and the Division of Consumer Advocacy and are dated September 26 and September 30 of 1991; March 2, March 23, April 2, April 8, and July 24 of 1992.

Energy Policy. The State of Hawaii would like the EIS to recognize that its current focus to support small-scale geothermal development to satisfy only the Island of Hawaii's power needs differs from the proposed action in the EIS. The EIS should address the State's goal of achieving a dependable, efficient, and economic statewide energy system and reducing its dependency on oil.

Federal, State, and local governments and geothermal developers. The State recommends a discussion of the relationship between Phases 3 and 4 and existing geothermal projects be included in the EIS. The EIS should discuss permitting for these projects and their supporting environmental documents. The State does not consider these projects as part of the HGP. The EIS should also include information about relations between the federal, State, and local governments, developers, and citizens.

Land Use. The EIS should at least estimate the amount of land area that would be required for such a large operation. The discussion should indicate whether the total acreage needed will be concentrated in one central area or scattered throughout the Island of Hawaii. Also, a map should be included to show possible sites for power stations and the geothermal well fields. Other concerns are the implications of land use after the plant is closed. The EIS should explain what will happen to the sites after the plants have surpassed their energy-generating capacities and when that is likely to happen. The EIS should examine the compatibility of geothermal development with existing and planned land uses. The EIS should address the purpose and objectives of the State statute on geothermal resource subzones and compatibility with existing land use.

Air Quality. The EIS should also discuss the effects of well field construction, well venting, accidents, and the smell of hydrogen sulfide (H_2S) and other gases. Although the volcano produces H_2S and causes acid rain effects, H_2S concentrations may be higher in localized areas near the plants. A monitoring and remediation program should be described. A map should also be included to indicate those areas and communities likely to be impacted. People may be able to detect H_2S levels below instrument detection. The relative air quality impacts of geothermal compared to those of possible alternative energy technologies need to be addressed.

Water Resources. The EIS should evaluate the effects of H_2S and other airborne emissions, not just solid and liquid wastes as proposed in the prep notice, on groundwater and surface water (fresh and marine). Water catchment systems should also be considered a potentially affected resource, and the effects of well venting and accidents on them should be determined. The nonpoint source pollution impacts on water quality should also be described. And the proposed monitoring and remediation program should be included and described.

Ecological Resources. The effects from the cable on all marine fauna (not just benthic) including Hawaiian monk seals need to be evaluated. There may be water column impacts, fisheries impacts, impacts on surf sites, swimming, and boating. Reefs, beaches, and other natural resources such as limu may be affected. A monitoring program should be developed to evaluate effects on ecological resources on an ongoing basis throughout the duration of the project. Baseline studies and stress indicators should be identified for monitoring. The EIS should also include a description of the impacts on endemic flora and fauna. Acid rain effects on ecological resources should be considered.

Geological Resources. The EIS should evaluate shoreline and nearshore impacts from the cable, including shore erosion, interference with currents and sand transport, reefs, and surf sites. Impacts from the long-term presence of the cable should be included and not be limited to placement and construction activities.

Noise. The EIS should evaluate long-term effects on flora and fauna and their habitat, as well as on nearby residential communities.

Health and Safety. The EIS should also include long-term health effects due to chronic exposure to noise, air pollution, water pollution, electromagnetic field, and psychological stress incurred from evacuations and the threat of evacuations. The physical and psychological welfare of residents in nearby communities must be evaluated. Public health monitoring should be provided.

Socioeconomic. The effects of lifestyle changes and disruption need consideration. Frequent evacuations and the threat of evacuations have socioeconomic impacts on neighboring communities. The EIS should also include a cost/benefit study that analyzes the likelihood of disruption or destruction of facilities by volcanic activity. Effects on utility and tax rates should be examined, as should impacts on farm employment resulting from loss of farm workers to industrial and tourism sectors.

Cultural Resources. A discussion of the impacts the project may have on the Native Hawaiian religion should be included. The EIS should reference prior court decisions concerning geothermal development and religion.

Scenic and Visual Resources. The EIS should evaluate the appropriateness and compatibility of the plants, roads, transmission lines, and cable with the surrounding environment. A view plane study may be helpful in illustrating the impacts on the scenic and visual resources of the area.

Alternatives. Clear definitions of alternatives should be provided in the EIS. Geothermal energy for the Big Island only should be one alternative. A thorough evaluation of all other available alternative energy technologies and their feasibilities should be done, including consideration of an aggressive conservation program. The EIS should examine impacts of alternative methods of disposing geothermal fluids, including reinjection, surface impoundment, and discharge to surface water bodies. The State Office of Hawaiian Affairs questioned the viability of several alternatives proposed by the public in scoping.

A summary of all new field studies conducted for the EIS and other studies contributing to the EIS, and a comprehensive review of the Phase 4 impacts at all of the possible sites should be included in the EIS.

Federal, State and Local Government and Geothermal Developers. One State office was concerned about the EIS treatment of scoping comments relating to "lack of government concern" and "collaboration between government and developers."

FEDERAL AGENCIES

National Marine Fisheries Service

In a March 6, 1992, letter and in comments on the working draft IP, the National Marine Fisheries Service (NMFS) characterized issues related to the underwater cable as important and sensitive. Two specific issues were identified for consideration in the EIS: impacts of the electromagnetic field on marine biota and impacts from trenching and laying transmission lines on nearshore marine habitats, including coral reefs.

National Park Service

In letters of February 24, 1992 [Hawaii Volcanoes National Park (HVNP)], February 28, 1992 [Pacific Area Office (PAO)], April 14, 1992, and in IP reviews of July 14, 1992 (HVNP), and July 17, 1992 (PAO), the National Park Service (NPS) offered the following comments.

The EIS should address potential impacts to NPS, a Prevention of Significant Deterioration Class I area. NPS is concerned about the potential for air contamination that might affect native plants and animals or might adversely affect the health of visitors and employees. An unbiased analysis of point

source emissions and an evaluation of impacts resulting from emissions of H_2S and criteria and non-criteria air pollutants and particulate emissions should be conducted. Cumulative and long-term effects of emissions and electromagnetic fields should be considered.

The EIS should analyze potential loss of Air Quality Related Values, including vista degradation, noise, and odors, which are important to the NPS's mandate to manage the backcountry for wilderness values. Light contamination should be considered, as should cumulative impacts of noise (including that generated by scenic tour aircraft). Mitigation measures should be discussed.

NPS expresses concern over the introduction of industrial land use in a region characterized by conservation, agricultural, and rural land uses. The EIS should include regional land-use issues, including maintaining buffers around State and national protected areas.

Impacts to the threatened Newell's Shearwater, recently spotted near HVNP, from lights, noise, drill rigs, overhead wires, fences, and emissions should be considered.

NPS reports that emergency remedies to thwart lava flow are not allowed in HVNP.

NPS requests that energy conservation be considered as an alternative.

U.S. Army Corps of Engineers (COE)

In its August 26, 1992, review of the working draft IP, COE noted that it has no plans to do any work on describing the rain forest and will not develop a Geographic Information System (GIS) base for wetlands. In addition, COE raised the following points:

- COE will not consult with DOE, Soil Conservation Service, U.S. Geological Survey, or U.S. Fish and Wildlife Service in the wetland delineation efforts and will not consult with those agencies regarding wetland significance or values as it is DOE's responsibility to carry out these consultations. DOE will make a detailed assessment to satisfy 404(b)(1) guidelines for the discharge of dredged or fill material. DOE should also be aware that the 404(b)(1) sequence involves avoiding fill, minimizing fill, and mitigating for fill.
- DOE must initiate Section 106 Historic Coordination for any discharge of dredged or fill material, as well as for the geothermal development.
- In Table 4.2 of the IP, U.S. Environmental Protection Agency should be added to COE 2; and FWS, NMFS, and Advisory Council on Historic Preservation should be added to COE 6. COE permit may also involve endangered species and historic sites.
- The EIS milestone schedule is very tight. Our experience indicates that 18 months from start of writing to decision point is very fast. COE may not be able to perform with any accuracy with this schedule.

U.S. Environmental Protection Agency (EPA)

EPA responded on April 15, 1992, to the NOI with a three-page letter with nine pages of comments covering nearly the full range of technical issues expected to be addressed in the EIS. Generally, EPA's recommendations about the topics to be covered in the EIS are consistent with DOE's. EPA also raises several issues — primarily regarding procedures and alternatives — which relate to DOE policy. Additional comments were made in their August 18, 1992, review of the working draft IP.

Policy

1. EPA requests that DOE publish a notice of a draft IP and solicit comments on the decisions DOE considers to be within the scope of the EIS. This procedure will provide a chance for public comment prior to the draft EIS (DEIS). EPA believes that DOE intends to use the IP process to make substantive decisions regarding preparation of the DEIS.

Further, EPA states that making the final IP available in public reading rooms would eliminate any further public input into DOE decisions until the DEIS is published, scheduled for early 1993.

2. DOE should be ready to prepare a supplemental environmental document if the decision about specific plant locations is made after the EIS is completed and the decision makes substantial changes in the proposed action or if the decision is relevant to the environmental concerns of the action or its impacts. The EIS should acknowledge the need for environmental documents for specific plants and include plans to prepare them in the EIS.
3. An EIS completion date of "early 1993" should not be cast in concrete; doing so may preclude important studies. Time should be allowed for essential studies to go forward.
4. DOE should conduct scientifically credible studies in a realistic time frame.

Alternatives

1. Objectives for alternatives, as well as the proposed HGP, should be stated clearly and addressed (e.g., partial federal funding for phase 3, reducing reliance on imported oil and increasing the State's energy self-sufficiency, meeting the State's future energy needs). The need for the HGP must be explained — the rationale for the need for geothermal power vs. alternative sources of energy or conservation efforts. The need for 500 MW(e) total or 100 MW(e) on the Big Island should be verified.
2. The EIS should place as much emphasis on alternatives to geothermal development, such as conservation, wind or solar, as it does on the alternative ways to accomplish the geothermal development (e.g., sites and routes).
3. Alternatives should include alternative energy sources, conservation, and how actions other than federal funding would affect HGP development.
4. Consideration should be given to alternatives to geothermal (e.g., sites and routes) and alternative drilling and development alignments for geothermal to minimize environmental and health and safety impacts.
5. Whether oil imports will be reduced because of geothermal development should be ascertained.
6. Reinjection alternatives should be considered.
7. The EIS should address downscaled geothermal program combined with other energy sources (e.g., solar and wind).
8. The EIS should compare per-capita energy consumption in Hawaii relative to other areas and states.
9. The EIS should consider environmental hazards for each alternative energy source.
10. The EIS should discuss pollution prevention measures for geothermal well sites, alternatives to drilling, and development of geothermal resources.
11. The EIS should identify DOE's perception of federal government's role in geothermal development if DOE does "not partially fund" HGP.
12. The EIS alternatives should be distinctly defined to provide a clear basis for decision makers and the public to choose among options.

Cumulative Impacts

1. The EIS should consider cumulative impacts with respect to the past, present, and reasonably foreseeable future actions. Measures to eliminate, minimize, and/or mitigate adverse cumulative impacts should be considered.

Mitigation

1. The EIS should discuss all relevant and reasonable mitigation measures, even if

they fall outside of the jurisdiction of the lead agency.

Air Quality

1. The EIS should consider background ambient air quality.
2. The EIS should address nonattainment of air-quality standards.
3. The EIS should consider the Clean Air Act as amended, which addresses the need to use the most recent and applicable data.
4. The EIS should characterize and quantify all expected air emissions, including hazardous air pollutants.
5. The EIS should consider adverse meteorological conditions that could affect air quality.
6. The EIS should identify sources of fugitive emissions and identify mitigation measures to lessen fugitive emissions.
7. The EIS should consider air-quality-monitoring programs.
8. Mitigation for air quality should not be limited to episodes where standard are exceeded.

Water

1. Identify wetlands and describe the extent of impacts, adhering to the principals set forth in the Clean Water Act, Section 404.
2. Consider erosion potential and control measures.
3. Consider surface- and groundwater-monitoring programs and actions that should be taken if unacceptable conditions occur.
4. Address the detection of well casing leakage and tests to ensure well integrity.
5. Address thermal change and measures to prevent such impacts.
6. Consider water sources necessary to support drilling activities.
7. Consider water quality, geohydrology, and subsurface lithology.
   (a) For subsurface lithology, pay special attention to cinder beds, lava tubes, and fractures that would allow migration of geothermal brine from the surface into groundwater (interconnections between surface- and groundwater).
   (b) Consider the flow direction of groundwater.
   (c) Consider effects of reinjection on seismicity and groundwater flow.
8. Address impacts to the ocean.
9. Identify the constituents of the geothermal brine and chemical constituents of the spent geothermal brine.
10. Identify (on a map) wells within 1 mile of the outer boundary of the HGP area.
11. Work closely with EPA's Underground Injection Control program to identify and protect underground sources of drinking water.
12. Consider EPA's reinjection permit.

Ecological Resources

1. Discuss plans for pollution prevention, maintenance of biodiversity, and minimization of impacts to the environment, including methods of controlling invasion of alien species.
2. Instead of discussing impacts on individual species, discuss ecosystem-level impacts from deforestation and the loss of habitat and from construction and maintenance of the underwater cable. Also, consider impacts on the natural mosaic of the landscape, which is fundamental to the functions of the rain forest.
3. Quantify the amount of rain forest expected to be lost and characterize rain forest flora.
4. Describe land- and ocean-based resources that would be affected by the construction and maintenance of transmission lines and cables.
5. Discuss electromagnetic fields and the effects of these fields on land- and ocean-based fauna.

6. Identify threatened, endangered, and candidate plant and animal species affected by the proposed action and alternatives. Discuss impacts and mitigation.
7. Identify impacts to riparian and ocean habitats and describe management practices to eliminate or minimize these impacts.
8. Explore options to consolidate geothermal activities to minimize disruption to the rain forest and other sensitive ecosystems.
9. Consider "devegetation" areas of the tropical rain forest.
10. Provide for monitoring of erosion and sedimentation control to ensure adequacy of these activities.

Hazardous Materials and Wastes

1. Identify all hazardous materials expected to be used in geothermal development.
2. Identify appropriate permits.
3. Identify constituents in drilling muds and geothermal fluids.
4. Characterize the proposed project's anticipated waste stream.

Health and safety

1. Discuss relative risks and impacts of natural disasters on the operation, control, and transmission technology of the proposed HGP.
2. Identify measures to protect the health and safety of workers and the public from development, operations, and potential accidents.
3. Analyze all potential equipment failures that could result in steam or other emissions venting.
4. Identify and characterize all materials that could be released into the environment.
5. Discuss the human health impacts of electromagnetic fields.

Emergency Preparedness

1. Detail emergency planning and notification procedures in response to geothermal releases.
2. Consider "community right-to-know" provisions of the Superfund Amendments and Reauthorization Act Title III in emergency preparedness planning.

Noise

1. Noise should be assessed in the EIS.
2. Describe noise reduction measures during all stages of geothermal development and operation.

Socioeconomic Impacts

1. The following socioeconomic issues should be addressed: a) changes in employment and population and the resulting demand on housing and transportation; b) worker availability and potential places of residence; and c) indirect impacts on islands receiving geothermal energy.
2. Factor long-term costs of the project, including replacement wells and additional wells.

Cultural Resources

1. Consider the National Historic Preservation Act of 1964, particularly compliance with Section 106.
2. EPA advises close cooperation with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation.
3. Consider the possibility of increased vandalism due to enhanced access into the proposed geothermal resource area and identify proposed measures to minimize such impacts.

Background/Information Resources

1. The U.S. Department of Interior Final EIS for Geothermal Leasing Program (1973) was identified as a resource that should be considered in preparing this EIS. This document addresses environmental impacts and mitigation measures.

Other

1. Provide maps and locations of production and injection wells, roads, piping, and power transmission lines, hazardous material storage areas, earthquake fault zones, and brine impoundments (also, identify the monitoring process).
2. Provide procedures for well-site location and construction, rehabilitation of land damaged by construction activities, plans to protect existing natural resources, and maintenance activities.
3. Identify measures to replace wells whose production has decreased.
4. Discuss what will be done with exploratory wells.
5. Explain relationships among federal, State, and local governments and private developers now with the HGP.
6. Address impacts on speleology.

U.S. Fish and Wildlife Service

In an undated response to the NOI and communication on February 27, 1992, and August 26, 1992, the FWS stated that the EIS should assess effects of fragmentation, predation and competition by exotic species to endangered and threatened species. Impacts of acute and chronic releases of H_2S and other pollutants on wildlife and vegetation should be assessed. FWS recommends an ecosystem-level analysis to determine the effects on the integrity of the native rain forest. The EIS should determine effects of reinjection of geothermal fluids on groundwater flowing into anchialine pools along the Kapoho coastline.

The FWS recommends the following specific studies to assess impacts: studies of the distribution and abundance of the hoary bat; native forest birds, particularly the 'O'u; endangered and candidate plant species; and invertebrates (i.e., endemic land snails and insects that are the food base of native birds). A wetlands study and a post-project analysis of effects of the True/Mid Pacific geothermal facility are also recommended.

U.S. Geological Survey

The USGS provided the following comments in a March 1992 letter. On August 13, 1992, USGS reported no comment on the working draft IP.

The EIS should examine allocation of groundwater resources and the effect of geothermal fluids and waste waters on aquifers.

USGS recommends that eruption conditions be used as baseline data against which expected air emissions can be judged.

USGS asserts that volcanic eruption frequency, lava flow, and airborne lava, as well as deformation hazards from the movement of liquid magma, present hazards for wells, pipelines, generating facilities, and transmission lines. The EIS must consider natural and induced seismic hazards. USGS acknowledges that responsibility for induced seismic hazards is ambiguous.

The EIS should identify the most likely land source for future undersea slides. Economic impacts resulting from potential damage to the undersea transmission cable by rockslides, sand slides, and turbidity-current deposits should be considered in the EIS.

USGS also reviews ongoing research and existing documents and data bases that are relevant to these issues.

U.S. Navy

The U.S. Navy responded on May 1, 1992, to the Notice of Intent and expressed concerns about the submarine power transmission routes, electrical interferences emanating or caused by the cables, and any effects to shipboard operations.

APPENDIX C

OUTLINE FOR THE HAWAII GEOTHERMAL PROJECT ENVIRONMENTAL IMPACT STATEMENT

This appendix presents an outline of the *Environmental Impact Statement for the Hawaii Geothermal Project*. The outline is subject to change as preparation of the EIS progresses.

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- ARCHAEOLOGICAL ASSESSMENT
- ETHNOGRAPHIC ASSESSMENT

APPENDIX D

GLOSSARY OF TERMS USED IN THE IMPLEMENTATION PLAN

aesthetic—related to pleasing the senses, particularly involving visual beauty.

alternating current (ac)—an electric current that reverses direction at regular intervals, usually many times per second.

ambient—encompassing atmosphere; background characteristics.

anchialine ponds or pools—brackish water bodies (transitional between marine and fresh) containing unique flora and fauna.

aquifer—permeable rock, sand, or gravel capable of yielding a large quantity of groundwater.

attainment—meeting environmental standards (e.g., National Ambient Air Quality Standards) set forth by law.

benthic—occurring at or near the bottom of a body of water.

biodiversity—a wide variety of organic life; diverse animal and plant types.

brackish—water that is intermediate in total dissolved salts between marine (~35,000 milligrams per liter) and fresh water (<1,000 milligrams per liter).

catchment basin—a surface or rain water collection facility.

ciguatera—a type of fish poisoning that can occur following ingestion of certain tropical reef and marine species. Ciguatera is found in coral reef belts, is more common in nonmigratory fishes around islands, and is probably due to a combination of several toxins.

climatological—relating to climates and their phenomena.

conservation—a careful preservation and protection of the environment; measures taken to minimize energy consumption.

conversion system—facilities for converting electricity from direct current (dc) to alternating current (ac) and vice versa.

cooperating agency—as defined by CEQ regulations (40 CFR Part 1501.6), any agency, other than the lead agency, that has jurisdiction by law or special expertise with respect to any environmental issue.

cumulative impacts—result from incremental impact of an action when added to other past, present, and reasonably foreseeable future actions.

demand-side management (DSM)—various conservation strategies that reduce electricity demand by improving energy efficiency of consumer equipment and buildings.

deterministic approach—(in risk analysis) determining the magnitude of the maximum credible natural phenomena event (e.g., hurricane, volcanic eruption, earthquake) without regard to its probability of occurrence. An approach to risk analysis that is often used when probabilities are highly uncertain.

developer—one who invests capital to develop new processes, equipment, technologies, or resources such as geothermal facilities.

dewatering—removing or draining water from an excavation, enclosure, or structure; also, removal of water from solid material.

dielectric—a material that is an electric insulator or in which an electric field can be sustained with a minimum dissipation of power.

direct current (dc)—electric current that flows in one direction only, as opposed to alternating current.

dose-response—measure of sensitivity of a biological system to a stimulus.

drilling mud—a mixture of water, bentonite, and barite slurry used for drilling wells; circulating drilling mud is used to bring drill cuttings to the surface and to exert back-pressure in the hole.

ecosystem—a functional system that includes the organisms of a natural community together with their environment.

electrical load (demand)—the electricity consumption by one or more consumers.

electromagnetic field (EMF)—The energy field surrounding electrical charges and currents. In the context of this report, EMFs result from voltages and currents in transmission lines. Radio waves, microwaves, visible light, and those fields from transmission lines are all forms of electromagnetic fields.

endangered species—a species threatened with extinction.

endemic—belonging to or native to a particular people or country.

ethnobotanical—relating to how cultures use plants and plant products; the plant lore of a people.

ethnographic—relating to the systematic recording of human cultures.

ethnohistorical—relating to the study of the development of cultures; the interpretation of the significance of archaeological findings by means of documentary material.

floodplain—area that is periodically inundated by surface waters.

fugitive emissions—non-process emissions (e.g., leaks from pipe joints, dust from traffic on roads).

geodetic—relating to or determined by geodesy, a branch of mathematics that determines the size and shape of the earth and the exact points on its surface.

geologically active—anything subject to change over geologic time; usually refers to land mass movements.

geothermal extraction—recovery of natural heat from rock and fluid beneath the earth's surface.

geothermal power—geothermal energy converted to electrical energy.

geothermal resource—natural heat from the earth that can be economically converted to electrical energy or used directly for heating buildings.

gross capacity—total power generated by a facility.

ground water—all subsurface water, especially that part in the zone of saturation.

grubbing—clearing stumps and roots by digging.

hydrogeology—the science dealing with the occurrence of ground water and its utilization.

hydrology—the science of the occurrence, circulation, distribution, and properties of the waters of the earth and their reaction with the environment.

indigenous—having originated in or naturally occurring in a particular region or environment.

injection well—a well into which water, spent brines, or gases are pumped in order to maintain subterranean pressure or to dispose of waste fluids.

integrated resource planning (IRP)—an approach that attempts to find the lowest cost for meeting energy demand through increasing supply or improving end-use energy efficiency.

invertebrate—species that lack a spinal column, including insects, worms, and the like.

megawatts electrical generation [MW(e)]—1,000,000 watts (1 million watts) electrical generation.

meteorological—of or relating to the science that deals with the atmosphere and its phenomena.

milestone—a significant point in development with the passage of time.

mitigation—refers to measures implemented to reduce an environmental impact to acceptable levels.

non-native species—a species that does not occur naturally where it is found.

particulate—fine solid particle that remains individually dispersed in gases and stack emissions.

petroleum refining residuals—high boiling fraction remaining after removal of more volatile liquids.

potable—refers to water that is suitable for human ingestion.

production well—a well from which geothermal brines or steam is extracted.

rain forest—a tropical woodland with an annual rainfall of at least 100 inches and marked by lofty broad-leaved evergreen trees forming a continuous canopy.

reinjection—the return of water, spent geothermal brines, or gases via an injection well after use in a power plant.

renewable energy—nondepletable energy (e.g., solar, wind).

rift—(geology) refers to (1) the boundary between crustal plates that are separating from one another; and (2) fissures that radiate outward from a volcano into which magma (lava) is injected.

scoping process—refers to the methods by which public and agency input are solicited regarding environmental issues to be addressed in an environmental impact analysis.

seismic—pertaining to energy released by ground motion.

silicates—common minerals in the earth's crust consisting of silicon and oxygen in ratios varying from 1:2 to 1:4.

socioeconomics—relating to or involving a combination of social and economic factors.

solid dielectric cable—one whose insulator is one of several solid materials such as ceramic, mica, glass, plastic film, or paper.

stagnation—absence or cessation of movement, growth, or activity.

subsidence—(geology) lowering of the land surface usually by withdrawal of fluids from below.

subsistence—the condition of remaining in existence; the minimum (as food or shelter) necessary to support life.

subzone—Geothermal Resource Subzone (GRS) (there are 3 subzones: upper, middle and lower) in Kilauea's east rift geothermal resource zone.

synergistic effects—an action where the total effect of two or more components in a mixture is greater than the sum of their individual effects.

tephra—denotes all rocks composed of fragmented volcanic products ejected during eruption. Used in this document to denote the portion of lava released airborne during eruption.

transport pathways—the paths (routes) that contaminants take between contaminant sources and receptors; these contaminant paths may be airborne, water-borne, or groundwater-borne.

tsunami—a long-period sea wave produced by an earthquake, submarine volcanic eruption, or other submarine disturbance.

vog/volcanic smog—a natural aerosol containing a mixture of volcanic dust particles and volcanic gases, mainly water vapor, carbon dioxide, and sulfur dioxide.

volcanic dike—a tabular body of rock, congealed from magma (lava) injected into fissures or rift zones.

well blowout—uncontrolled venting of liquids and/or gases from a well.

well casing—tubing inserted into a drill hole to serve as a liner.

well quenching—introducing cool water into a well that is out of control to reduce the production of steam, thereby bringing the well under control.

well venting—release of well fluid to the atmosphere, either controlled or uncontrolled.

wetlands—areas such as swamps, marshes, bogs, and estuaries; to be considered under the "wetlands" Army Corps of Engineers legal definition, an area must possess three characteristics: hydrophytic vegetation, hydric soils, and wetland hydrology.

APPENDIX E

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

ac	alternating current
ACHP	Advisory Council on Historic Preservation
ANOI	Advance Notice of Intent
CCH	City and County of Honolulu
CEQ	President's Council on Environmental Quality
CFR	*Code of Federal Regulations*
CG	U.S. Coast Guard
COE	U.S. Army Corps of Engineers
DBEDT	(State of Hawaii) Department of Business and Economic Development and Tourism
dc	direct current
DLNR	(State of Hawaii) Department of Land and Natural Resources
DOE	U.S. Department of Energy
DOH	State of Hawaii Department of Health
DOI	U.S. Department of the Interior
DSM	demand-side management
EIS	Environmental Impact Statement
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
ESCP	Erosion and Sedimentation Control Plan
Fed Reg.	*Federal Register*
FHA	U.S. Federal Highway Administration
ft	feet
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
GRS	geothermal resource subzone
H_2S	hydrogen sulfide
HC	Hawaii County
HDWC	Hawaii Deep Water Cable Program
HECO	Hawaiian Electric Company, Inc.
HELCO	Hawaii Electric Light Company, Inc.
HGP	Hawaii Geothermal Project
HRS	Hawaii Revised Statutes
HVAC	high-voltage alternating current
HVDC	high-voltage direct current
HVNP	Hawaii Volcanoes National Park
IP	Implementation Plan
IRP	integrated resource planning
KERZ	Kilauea East Rift Zone
kV	kilovolt
MC	Maui County
MECO	Maui Electric Company, Ltd.
MOU	Memorandum of Understanding
MW(e)	megawatt (electrical generation)
NAAQS	National Ambient Air Quality Standards

ACRONYMS AND ABBREVIATIONS (*continued*)

NAV	U.S. Navy
NEPA	National Environmental Policy Act
NIOSH	National Institute for Occupational Safety and Health
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPS	National Park Service
NSF	National Science Foundation
ORNL	Oak Ridge National Laboratory
OSHA	U.S. Occupational Safety and Health Administration
OSP	(State of Hawaii) Office of State Planning
Pub. L.	Public Law
PSD	Prevention of Significant Deterioration
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCS	U.S. Soil Conservation Service
USGS	U.S. Geological Survey
vog	volcanic smog

APPENDIX F

COPIES OF THE ADVANCE NOTICE OF INTENT AND NOTICE OF INTENT

National Technical Information Service

Inventions for Licensing Available Through New Electronic Bulletin Board

The National Technical Information has implemented a new Patent Licensing Bulletin Board (PLBB) to assist companies in finding new Government owned inventions which are available for licensing. The PLBB is a bulletin board system designed to provide electronic and early access to information on hundreds of new Government patents and pending patent applications available for licensing—often exclusively—under the regulations for the Licensing of Government Owned Inventions (37 CFR part 404).

The inventions abstracted in the PLBB may be licensed through NTIS' Center for the Utilization of Federal Technology (CUFT) and represent new technologies from several Federal agencies and laboratories, including the:

- Agricultural Research Service,
- Bureau of Mines,
- Centers for Disease Control,
- Department of Commerce,
- Department of Transportation,
- Department of Veterans Affairs,
- Environmental Protection Agency,
- Food and Drug Administration,
- Forest Service, and
- National Institutes of Health.

The PLBB summarizes each invention and identifies supporting material which may be ordered for more complete information. There is no charge for the use of the PLBB, the only cost is that of the phone call to the PLBB which is placed through a microcomputer modem.

For additional information and a User's Manual on the PLBB, please call CUFT at (703) 487–4738 or write to: Director, Center for the Utilization of Federal Technology P.O. Box 1423, Springfield, VA 22151.

Those already familiar with accessing computer bulletin boards may dial up the PLBB at (703) 487–4061.

Douglas J. Campion,

Potent Licensing Specialist, Center for the Utilization of Federal Technology, National Technical Information Service, U.S. Department of Commerce.

[FR Doc. 91–20963 Filed 8–30–91; 8:45 am]

BILLING CODE 3510–04–M

DEPARTMENT OF ENERGY

Advance Notice of Intent To Prepare an Environmental Impact Statement for the Hawaii Geothermal Project, Phases 3 and 4: Resource Verification and Characterization, and Construction and Operation of Geothermal Powerplants

AGENCY: U.S. Department of Energy (DOE).

ACTION: Notice is hereby given that the Department of Energy (DOE) intends to prepare an environmental impact statement (EIS) for the development of a geothermal wellfield on the island of Hawaii (Big Island), State of Hawaii; the subsequent construction and production of up to 500 MW(e) of power; and the transmission of this power by overland and submarine cable to Oahu, and possibly, one or more of the other Hawaiian Islands.

SUMMARY: As part of the National Environmental Policy Act (NEPA) of 1969 planning process, DOE announces its intent to prepare an EIS that evaluates the significance of environmental impacts associated with the proposed Hawaii Geothermal Project (HGP). The HGP is the culmination of research and development efforts begun in the mid-1970's to explore the feasibility of using Hawaii's indigenous geothermal resource as an alternative energy source for the production of electricity. Currently, the State of Hawaii uses petroleum for approximately 90 percent of its power production, the highest usage among all 50 states.

The four-phase HGP, as defined by the State of Hawaii, consists of (1) exploration and testing of the geothermal resource beneath the slopes of the active Kilauea volcano on the island of Hawaii (Big Island), (2) demonstration of deep-water cable technology in the Alenuihaha Channel between the Big Island and Maui, (3) verification and characterization of the geothermal resource identified in Phase 1, and (4) construction of commercial geothermal power production facilities on the Big Island, with the potential for overland and submarine transmission of electricity from the Big Island to Oahu and other islands. Phases 1 and 2 have been completed; DOE prepared appropriate NEPA documentation for separate federal actions related to early research projects. Future activities under Phases 3 and 4 will be the subject of this EIS.

The purpose of this Advance Notice of Intent (NOI) is to encourage early public involvement in the NEPA process and to solicit comments on the proposed scope and content of the EIS. Comments are expected regarding potential sites for geothermal development; alternatives to geothermal power; and environmental issues, such as land use, habitat disturbance, effects on cultural resources, air quality degradation, and impacts to the terrestrial and marine environment. The precise location of sites for geothermal power plants will not be known until the State completes currently planned resource verification and characterization activities on the Big Island. Land areas having the greatest potential for development, as defined by past research and exploration, are located within three designated Geothermal Resource Subzones on 22,000 acres in the lower and middle Kilauea East Rift Zone in the Puna District on the Big Island.

DOE will publish a NOI in the fall of 1991 to solicit further public input and to announce a schedule for public scoping meetings to be held prior to the completion of an EIS Implementation Plan and initiation of EIS preparation.

DATES: Comments related to the preparation of this EIS are requested by October 3, 1991.

ADDRESSES: Written comments or questions should be directed to: Dr. Lloyd Lewis, CE–121, Office of Conservation and Renewable Energy, U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585, Telephone: (202) 586–6263.

FOR FURTHER INFORMATION CONTACT: General information on the Hawaii Geothermal Project may be obtained from Dr. Lloyd Lewis at the above address. General information on the procedures followed by DOE in complying with the requirements of NEPA may be obtained from: Ms. Carol Borgstrom, Director, Office of NEPA Oversight (EH–25), U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585, Telephone: (202) 586–4600.

SUPPLEMENTARY INFORMATION:

Background

As defined by the State of Hawaii, the four-phase HGP consists of (1) assessment of the geothermal resource present beneath the slopes of the active Kilauea volcano on the Big Island, (2) demonstration of deep-water cable technology in the Alenuihaha Channel between the Big Island and Maui, (3) verification and characterization of the geothermal resource identified in Phase 1, and (4) construction of commercial

geothermal power production facilities on the Big Island, with the potential for overland transmission and submarine transmission to Oahu and other islands. Phases 1 and 2 have been completed. Future activities under Phases 3 and 4 will be the subject of this EIS.

Geothermal exploration began in Hawaii in 1972 with funding from the National Science Foundation (NSF). A potential geothermal resource site was identified on the Kilauea East Rift on the Big Island. Subsequent exploratory drilling (also funded by NSF) between December 1975 and April 1976 resulted in a productive geothermal well at a depth of approximately 6000 ft. In 1976, the Energy Research and Development Administration (ERDA), a predecessor to DOE, funded testing of the geothermal well, which was named HGP-A. Subsequently, DOE was established, and it funded the development of a 3-MW(e) demonstration power plant at the HGP-A site. In 1986, the HGP-A well and power plant were transferred by DOE to the State of Hawaii to be used for further research. The State has referred to this early exploration and testing of the geothermal resource as Phase 1 of the HGP.

DOE also provided funds for the Hawaii Deep Water Cable Program, referred to by the State of Hawaii as Phase 2 of the HGP, which was initiated in 1981. The goal of the program was to determine the technical and economic feasibility of constructing and operating a deepwater submarine power transmission cable that would link the islands of Hawaii and Oahu and would operate for a 30-year period. This project was completed in 1991 and proved the feasibility of a deepwater transmission cable. In all, over an 11-year period, DOE has provided approximately $33 million for geothermal and cable research in Hawaii.

In April 1989, the State of Hawaii requested additional federal funding for what it defined as Phase 3 of the HGP, Resource Verification and Characterization. Congress subsequently appropriated $5 million for use in Phase 3. Because Phase 3 work is by nature "research" rather than development or project construction, Congress indicated to the Secretary of Energy that it is not a "major federal action" under NEPA and would not typically require an EIS. However, because the project is highly visible, somewhat controversial, and involves a particularly sensitive environmental resource in Hawaii, Congress directed that "* * * the Secretary of Energy shall use such sums as are necessary from amounts previously provided to the State of Hawaii for geothermal resource verification and characterization to conduct the necessary environmental assessments and/or environmental impact statement (EIS) for the geothermal initiative to proceed." In addition to the Congressional directive, the U.S. District Court of Hawaii rendered a judgment, in response to litigation filed by several environmental groups, that requires the federal government to prepare an EIS for Phases 3 and 4 prior to disbursement of additional funds to the State. This Advance NOI is being issued to begin the NEPA process for Phases 3 and 4.

Scope of Phases 3 and 4

The State of Hawaii considers the unknown extent of the resource as the primary obstacle to private investment and commercial development of geothermal power production facilities and cable system. The State and private industry experts estimate that at least twenty-five commercial-scale exploratory wells will need to be drilled to verify the generating potential of the resource. Phase 3 activities would include well drilling, logging of cores from holes, measuring temperatures, collecting and analyzing geothermal fluid samples, and taking downhole geophysical and geochemical measurements.

Once the geothermal resource has been characterized, the construction of from ten to twenty separate geothermal power plants of from 25–30 MW(net) each is forecast by the State of Hawaii. The actual number of geothermal plants will depend on the extent of the resource defined in Phase 3. The exact location of the plants will not be known until Phase 3 is completed and facility design and layout are underway. Based on current knowledge of the resource (i.e., flow, pressure, temperature), the State of Hawaii estimates a total of about 125 production wells and 30 injection wells may be needed. The plants would most likely be connected by a network of roads, plumbing, and overland transmission lines in the East Rift area. Overland and underwater transmission lines (300 kV AC or DC) would be constructed to distribute power across the Big Island and to the other Hawaiian Islands, in particular, Oahu.

The current timetable for Phases 3 and 4 of the HGP calls for the State of Hawaii to initiate permitting and financing in 1991, with resource verification to be conducted after NEPA documentation is completed. Procurement and installation of power plants by the State of Hawaii and other non-federal entities is anticipated to begin in the 1994–1996 period, with initial transmission to Oahu no sooner than 1995. The State hopes to have 500 MW(e) of geothermal power on-line by 2005.

EIS Content and Identification of Environmental Issues

The EIS format and content will correspond to that which is recommended in the CEQ regulations and DOE guidelines. Chapter 1 of the EIS will discuss the purpose of and need for the action, provide background on the proposed project, and define the scope of the EIS. In chapter 2, the activities to be carried out as part of the proposed action and alternative actions will be described, the project location will be defined, and a tabular summary comparison of impacts of alternatives will be presented. Chapter 3 will describe the environment that could be affected by the proposed action. In chapter 4, the environmental consequences of alternatives will be discussed.

DOE has conducted a preliminary screening of environmental issues that could arise as a result of the HGP. The EIS will include, as appropriate, consideration of the following categories of impacts at alternative sites for power plant construction and operation and for alternative cable routings over land and in the marine waters of the Hawaiian Islands.

- *Land Use:* Conflicts with plans, policies, and controls resulting from wellfield development, power plant siting, and overland transmission lines;
- *Air Quality:* Impacts of fugitive dust from construction and vehicle and equipment operation, atmospheric emissions from geothermal plants, and cooling tower drift;
- *Water Resources:* Effects of spills, solid waste disposal, and injection of spent geothermal fluids on groundwater and surface water (freshwater and marine);
- *Ecological Resources:* Effects of habitat disturbance, atmospheric emissions, and changes in surface water quality on terrestrial and aquatic ecosystems, including the lowland rain forest, benthic marine fauna, wetlands, and threatened and endangered species;
- *Geological Resources:* Changes in physiography, topography, geology, soils, volcanic activity, and seismic activity;
- *Noise:* Effects of well-drilling and well-venting noise on sensitive receptors and fauna;
- *Health and Safety:* Hazards to occupational and public health and

safety, including well blowouts, subsidence, toxic emissions, hazardous materials, and electromagnetic effects on terrestrial and aquatic life.

• *Socioeconomics:* Effects of commercialization on population growth, economic base, agriculture, labor pool, housing, transportation, utilities, public services, education, recreation, tourism, and historic, archaeological and cultural resources; and

• *Scenic and Visual Resources:* Effects of industrialization on aesthetics in the tropical environment.

NEPA and the Scoping Process

In preparing the EIS, DOE will conduct the NEPA process as prescribed in the Council on Environmental Quality "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" (40 CFR parts 1500–1503) and the DOE "Guidelines for Compliance with the National Environmental Policy Act" (52 FR 47662, December 15, 1987), as amended.

After consideration of comments received in response to this Advance NOI, DOE will publish a NOI and will initiate preparation of a preliminary EIS Implementation Plan to serve as guidance for the impact analysis. Anticipated topics to be addressed include: Scope of the EIS, purpose of and need for the action, development of alternatives to the proposed action, and categorizing of environmental and institutional issues. The EIS Implementation Plan will be further refined subsequent to the comment period that follows the NOI. Scoping meetings to be held in Hawaii will be announced in the NOI. The schedule for publication of the draft EIS will depend on the degree of effort foreseen based on the issues raised during the scoping process. A 45-day comment period will follow publication of the draft EIS and will include public hearings as a forum for oral comments. Availability of the draft EIS, the timeframe of the public comment period, and the schedule for public hearings will be announced in the **Federal Register** and in local news media upon release of the draft.

A final EIS, which will include DOE's responses to public comments received on the draft EIS, will be announced in the **Federal Register** upon publication.

Signed in Washington, DC, this 27th day of August 1991, for the United States Department of Energy.

Peter N. Brush,

Acting Assistant Secretary, Environment, Safety and Health.

[FR Doc. 91-21012 Filed 8-30-91; 8:45 a.m.]

BILLING CODE 6450-01-M

Atlanta Support Office; Noncompetitive Award of Financial Assistance: The Association for Commuter Transportation

AGENCY: U.S. Department of Energy.

ACTION: Notice of noncompetitive financial assistance award.

SUMMARY: The Department of Energy (DOE), announces that pursuant to DOE Financial Assistance Rules 10 CFR 600.7(b)(2), it intends to award a grant to the Association for Commuter Transportation (ACT) in support of a national conference focusing on transportation management associations. The anticipated overall objective of this project is to provide a forum for transportation management associations, Federal officials and State officials to address issues of joint concern.

SUPPLEMENTARY INFORMATION: The proposed award will serve the public purpose of increasing energy efficiency in the transportation end-use sector through stimulation of improvements in the operation of existing Transportation Management Associations and through encouragement and guidance of those seeking to establish new Transportation Management Associations. This conference is of particular significance since no other conference has ever been held which is specifically devoted to the needs of the rapidly growing area of Transportation Management Associations.

The grant application is being accepted by DOE because it knows of no other organization which is conducting or planning to conduct this type of conference. The project period for the grant award is a one-year period, expected to begin in September 1991. DOE plans to provide funding in the amount of $10,000 for this project period.

FOR FURTHER INFORMATION CONTACT: Warren Zurn, U.S. Department of Energy, Atlanta Support Office, 730 Peachtree Street, NE., Atlanta, Georgia 30308, (404) 347–1047.

Issued in Chicago, Illinois on August 22, 1991.

Timothy S. Crawford,

Assistant Manager for Administration.

[FR Doc. 91-21008 Filed 8-30-91; 8:45 am]

BILLING CODE 6450-01-M

Cooperative Agreement

AGENCY: U.S. Department of Energy (DOE).

ACTION: Notice of intent.

SUMMARY: The U.S. Department of Energy Field Office, Idaho announces that pursuant to the DOE Financial Assistance Rules 10 CFR 600.14(e) it intends to award a Cooperative Agreement to National Food Processors Association. The objectives of the work to be supported by this Cooperative Agreement provide for research and development of a sonic temperature sensor for food processing. Phases II and III.

FOR FURTHER INFORMATION CONTACT: Mary V. Willcox, U.S. Department of Energy, DOE Field Office-Idaho, 785 DOE Place MS 1129, Idaho Falls, Idaho 83402–1129, 208/526–2173.

SUPPLEMENTARY INFORMATION: The statutory authority for the proposed award is Public Law 93–577, the "Federal Non-Nuclear Energy Research and Development Act of 1974 (ERDA). The unsolicited proposal meets the criteria for "justification for acceptance of an unsolicited proposal (JAUP)," as set forth in 10 CFR 600.14(e). The second phase will focus on the further investigation of the design of a sonic sensor to measure the temperature of food particles inside food containers and the determination of the physical properties of various food materials. For this purpose a prototype sensor will be developed, used and modified as more knowledge of the technology is obtained. The third phase will be the development of a pilot scale unit which is suited for installation in a food processing plant for verification of the prototype developed in the second phase. The anticipated total project period is two (2) years, completion of the individual phases will be on a twelve (12) month basis. The total cost of the project (all shares) is estimated at $1,136,254.00. Total project costs will be shared (85%/15%) $996,740.00 for DOE and $139,500.00 for NFPA. The estimated

AUTHORITY FOR MAINTENANCE OF THE SYSTEM:

5 U.S.C. 301, Departmental Regulations; 37 U.S.C. 601–604; and 44 U.S.C. 3101.

PURPOSE(S):

To provide nonjudicial financial management of military pay and allowances payable to active duty, fleet reserve, and retired Navy and marine Corps members for the period during which they are medically determined to be mentally incapable of managing their financial affairs.

ROUTINE USES OF RECORDS MAINTAINED IN THE SYSTEM, INCLUDING CATEGORIES OF USERS AND THE PURPOSES OF SUCH USES:

To officials and employees of the Department of Justice when there is reason to suspect financial mismanagement and no satisfactory settlement with the surety can be reached.

To officials and employees of the Department of Veterans Affairs in connection with programs administered by the agency.

The "Blanket Routine Uses" that appear at the beginning of the Department of the Navy's compilation of system of record notices also apply to this system.

POLICIES AND PRACTICES FOR STORING, RETRIEVING, ACCESSING, RETAINING, AND DISPOSING OF RECORDS IN THE SYSTEM:

STORAGE:

Papers records in file folders stored in file cabinets or other storage devices.

RETRIEVABILITY:

By name of the member.

SAFEGUARDS:

Files are maintained in file cabinets and other storage devices under the control of authorized personnel during working hours; the office space in which the file cabinets and storage devices are located is locked outside official working hours.

RETENTION AND DISPOSAL:

Five years after closure of case, files are transferred to the Federal Records Center, Suitland, MD 20409 for permanent retention.

SYSTEM MANAGER(S) AND ADDRESS:

Assistant Judge Advocate General (Civil Law), Office of the Judge Advocate General, Navy Department, 200 Stovall Street, Alexandria, VA 22332–2400.

NOTIFICATION PROCEDURE:

Individuals seeking to determine whether this system of records contains information about themselves should address written inquiries to the Assistant Judge Advocate General (Civil Law), Office of the Judge Advocate General, Department of the Navy, 200 Stovall Street, Alexandria, VA 22332–2400. Request should contain the full name of the individual concerned and should be signed.

RECORD ACCESS PROCEDURES:

Individuals seeking access to records about themselves contained in this system of records should address written inquiries to the Assistant Judge Advocate General (Civil Law), Office of the Judge Advocate General, Department of the Navy, 200 Stovall Street, Alexandria, VA 22332–2400.

CONTESTING RECORD PROCEDURES:

The Department of the Navy rules for accessing records and contesting contents and appealing initial determinations by the individual concerned are published in Secretary of the Navy Instruction 5211.5; 32 CFR part 701; or may be obtained from the system manager.

RECORD SOURCE CATEGORIES:

Components within the Department of the Navy, medical doctors, approved trustees, prospective trustees, surety companies, and the Department of Veterans Affairs.

EXEMPTIONS CLAIMED FOR THE SYSTEM:

None.

[FR Doc. 92–3593 Filed 2–13–92; 8:45 am]

BILLING CODE 3810–01–F

DEPARTMENT OF ENERGY

Intent to Prepare an Environmental Impact Statement and Conduct Public Scoping Meetings for Phases 3 and 4 of the Hawaii Geothermal Project

AGENCY: U.S. Department of Energy (DOE).

ACTION: Notice of intent to prepare an environmental impact statement and conduct public scoping meetings for Phases 3 and 4 of the Hawaii Geothermal Project.

SUMMARY: Notice is hereby given that the Department of Energy (DOE) intends to prepare an environmental impact statement (EIS) for Phases 3 and 4 the Hawaii Geothermal Project (HGP) as defined by the State of Hawaii in its April 1989 proposal to Congress. Five scoping meetings will be held in Hawaii from March 7 through March 16, 1992, to afford the public an opportunity to raise environmental issues and concerns related to the proposed project. This Notice of Intent (NOI) follows an Advance NOI (ANOI) that was published in the **Federal Register** on September 3, 1991. Both the ANOI and NOI will be available for public review in reading rooms in Hawaii and the continental United States listed at the end of this NOI.

ADDRESSES: Requests for copies and questions about the Draft and/or Final EIS should be directed to: Dr. Lloyd Lewis, CE–121, Office of Conservation and Renewable Energy, U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585, Telephone: (202) 586–6263.

For general information on the DOE NEPA process, please contact: Ms. Carol Borgstrom, Director, Office of NEPA Oversight (EH–25), U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585, Telephone: (202) 586–4600 or (800) 472–2756.

SUPPLEMENTARY INFORMATION: DOE further announces its intent to prepare an EIS that identifies and evaluates the environmental impacts associated with the proposed HGP, as defined by the State of Hawaii in its April 1989 proposal to Congress. The EIS will be prepared pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA), as implemented by the President's Council on Environmental Quality regulations (40 CFR parts 1500–1508) and the DOE NEPA guidelines (52 FR 47662).

The four-phase HGP, as defined by the State of Hawaii, consists of (1) exploration and testing of the geothermal resource beneath the slopes of the active Kilauea volcano on the Big Island, (2) demonstration of deep-water power cable technology in the Alenuihaha Channel between the Big Island and Maui, (3) verification and characterization of the geothermal resource on the Big Island, and (4) construction and operation of commercial geothermal power production facilities on the Big Island, with overland and submarine transmission of electricity from the Big Island to Oahu and other islands. Phases 1 and 2 have been completed; DOE prepared appropriate NEPA documentation for separate Federal actions related to Phase 1 and 2 research projects. This EIS will consider Phases 3 and 4, as well as reasonable alternatives to the HGP. In this regard, in addition to considering non-geothermal alternative energy resources for power production (including, but not necessarily limited to, coal, solar,

biomass, and wind), the HGP EIS will consider the reasonable alternatives among submarine cable technologies; geothermal extraction, production, and power generating technologies; pollution control technologies; overland and submarine power transmission routes; and sites reasonably suited to support project facilities in a safe and environmentally acceptable manner.

The purpose of this Notice of Intent (NOI) is to again invite public participation in the DOE NEPA process and to solicit public comments on the proposed scope and content of the EIS.

INVITATION TO COMMENT: To ensure that the full range of issues related to the HGP are addressed, DOE invites comments on the proposed scope and content of the EIS from all interested parties. Written comments or suggestions to assist DOE in identifying significant environmental issues and the appropriate scope of the EIS should be mailed to: Dr. Lloyd Lewis, CE-121, Office of Conservaion and Renewable Energy, U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585. Telephone: (202) 586-6263.

Written comments should be postmarked by April 15, 1992 to ensure consideration. Late comments will be considered to the extent practicable.

In addition to soliciting written comments on the HGP EIS, DOE plans to hold scoping meetings in Hawaii at which agencies, organizations, and the general public will be invited to present oral comments or suggestions about the scope and content of the HGP EIS. The locations, dates, and times of meetings are described in a subsequent section of this NOI. Please note that written and oral comments will be given equal consideration during scoping of the EIS. All comments received during the scoping period will be summarized and responded to in an EIS Implementation Plan (IP) prepared by DOE. The IP will be made available for public review in reading rooms listed at the end of this NOI. The IP will list those issues and alternatives to the HGP identified during scoping that are within the scope of the EIS, and that therefore will be assessed in the EIS. The IP will also list those issues and alternatives that are outside the scope of the EIS and that therefore will be eliminated from further consideration. Further, the IP will provide a detailed outline for the Draft HGP EIS and will discuss the approach that DOE will take in its preparation, including proposed schedules and identification of cooperating agencies. The Draft EIS is expected to be completed by early 1993, at which time its availability will be announced in the Federal Register and in local media. The Draft EIS will be placed in the reading rooms listed at the end of this NOI. A public comment period will follow the release of the Draft EIS, during which time written comments will be accepted. Also, public hearings will be held in Hawaii at which DOE will receive oral comments on the Draft EIS. Comments on the Draft EIS will be addressed within the Final EIS.

Background

Description of the Proposed Action

The HGP, as defined by the State of Hawaii, is the culmination of research and development efforts begun in the mid-1970's to explore the feasibility of using Hawaii's indigenous geothermal resource for the production of electricity. Currently, the State of Hawaii uses petroleum for approximately 90 percent of its power production, which is the highest percentage usage of petroleum among the 50 states.

Geothermal exploration began in Hawaii in 1972 with funding from the National Science Foundation (NSF). A high-potential geothermal resource site was identified on the east rift of the Kilauea volcano on the Big Island. Subsequent exploratory drilling (also funded by NSF) between December 1975 and April 1976 resulted in a productive geothermal well at a depth of approximately 6000 feet. In 1976, the Energy Research and Development Administration (ERDA), a predecessor to DOE, funded the testing of the geothermal well, which was designated as the HGP-A well. DOE succeeded ERDA, and in 1979 it funded the development of a 3-MW(e) demonstration power plant at the HGP-A site. In 1986, the HGP-A well and power plant were transferred by DOE to the State of Hawaii to be used for further research. The State has referred to this early exploration and testing of the Big Island geothermal resource as Phase I of the HGP.

DOE also provided funds for the Hawaii Deep Water Cable Program, referred to by the State of Hawaii as Phase 2 of the HGP, which was initiated in 1981. The goal of the program was to determine the technical and economic feasibility of constructing and operating a deep water submarine power transmission cable that would serve the island of Oahu and would operate for a 30-year period. This project, which was completed in 1991, demonstrated the feasibility of the deep water power transmission cable. Over an 11-year period, DOE has provided approximately $33 million for geothermal and deep water cable research in Hawaii.

The State of Hawaii considers the unknown extent of the geothermal resource as the primary obstacle to private investment and commercial development. State and private industry experts estimate that at least 25 commercial-scale exploratory wells will need to be drilled to verify the generating potential of the resource. To that end, Phase 3 activities would include well drilling, logging of cores from holes, measuring temperatures, collecting and analyzing geothermal fluid samples, and making downhole geophysical and geochemical measurements.

After resource characterization, the State of Hawaii plan forecasts that from 10 to 20 separate geothermal power plants of from 25-30 MW(net) each could be developed. The actual number of plants will depend on the extent of the resource defined in Phase 3. The exact location of plants will not be known until Phase 3 is complete. Therefore, the EIS will have to rely on best available data and information to predict development sites. Based on current knowledge of the physical characteristics of the resource and contemporary geothermal energy development practice, the State estimates that about 125 production wells and 30 injection wells may be needed to produce 500 MW(e). The plants would most likely be connected by a network of roads, piping, and overland power transmission lines. Overland and underwater transmission lines (500 kV AC or DC) would be constructed to distribute power.

In April 1989, the State projected that permitting and financing for Phases 3 and 4 would occur in 1991 and that 500 MW(e) of power could be on-line by 2005. Based on the current schedule of State and Federal environmental reviews, these projections are not likely to be met.

DOE Participation in HGP

In April 1989, the State of Hawaii requested additional Federal funding for what is defined by the State as Phase 3 of the HGP: Resource Verification and Characterization. Congress appropriated $5 million for the State's use in Phase 3. Because Phase 3 work is essentially "research," not development or project construction, Congress indicated that this funding would not be considered a major Federal action under NEPA and would not typically require an EIS. However, because the project is highly visible, somewhat controversial, and involves a particularly sensitive

environment in Hawaii. Congress directed that "* * * the Secretary of Energy shall use such sums as are necessary from amounts previously provided to the State of Hawaii for geothermal resource verification and characterization to conduct the necessary environmental assessments and/or environmental impact statement (EIS) for the geothermal initiative to proceed." In addition to the Congressional directive, the U.S. District Court of Hawaii, in litigation filed by several environmental groups, ruled that the Federal government must prepare an EIS for Phases 3 and 4 of the HGP prior to any further disbursement of Federal funds to the State for the HGP.

An ANOI regarding preparation of the HGP EIS was issued in the **Federal Register** by DOE on September 3, 1991. It announced the initiation of planning and scoping of the HGP EIS and solicited public input regarding scope and content of the EIS. DOE received 55 comment letters on EIS-related topics, all of which will be considered during preparation of the IP for the EIS. In addition to the ANOI, DOE held informal information exchange meetings during September, October, and November 1991 with Federal, State and local agencies and officials and with public interest groups as well as utilities and geothermal developers.

Alternatives

DOE is requesting public comment on reasonable alternatives related to the HGP. The basic alternatives available to DOE are to partially fund or to not partially fund Phase 3, as defined by the State, with the funds remaining from the $5 million Congressional appropriation after EIS expenditures; not funding Phase 3 would be considered as the 'no-action' alternative. Under the 'no-action' alternative, DOE would not contribute funds to future State-planned geothermal development in Hawaii, but this would not preclude the State's continuation of the HGP.

Based on preliminary scoping, other alternatives related to project implementation include, but are not limited to: (1)Alternative sites for geothermal development and construction of power plants, including sites on Maui; (2) alternative routes for transmission lines on land and in the sea; (3) alternative geothermal power generating technologies; (4) alternative submarine cable technologies; (5) alternative power production technologies, such as coal, solar, wind, and biomass; (6) non-supply alternatives such as demand-side management and conservation; (7) integrated resource planning by Hawaiian utilities and the State, which would afford consideration of both supply-side and demand-side alternatives to meet long-term power generating needs; and (8) continued reliance on oil-fired power plants.

Potential Environmental Issues

Based on public comments on the Advance NOI and information exchange meetings held with the Federal, State, and local agencies, civic and environmental interest groups, and utilities and geothermal developers, DOE has identified an array of potential environmental issues associated with the HGP. This list will be modified based on further input received during the scoping process. The following list is not organized in order of relative importance, nor is there presently a commitment by DOE to address all these issues to the same level of detail in the HGP EIS. The future IP, prepared after scoping is completed, will categorize issues and describe those that are within the scope of analysis in the EIS.

Land Use

The compatibility of geothermal development with other current and planned land uses will be considered. Phases 3 and 4 of the HGP, as defined by the State, will require land for resource verification, power plant(s) and related support facilities, roads, transmission lines, waste disposal areas, etc. Potential impacts related to the Wao Kele O Puna rainforest, native Hawaiian homelands, residential areas, and any other unique land resources will also be considered.

Air Quality

The effect on air quality on the Big Island from atmospheric emissions from well drilling and testing, geothermal power plant operations, and construction associated with facilities, roads, and transmission lines will be considered. Air pollutants from geothermal power plant operation may include hydrogen sulfide, ammonia, methane, carbon dioxide, radon, arsenic, boron, mercury, benzene, and particulate matter. Receptors in the proximity of the proposed HGP include residential areas, agricultural crops, vegetation, and bird populations. The contribution of the HGP, if any, to the national and world-wide issues of global climate change and ozone depletion will be considered. The contribution, if any, of power plant emissions of hydrogen sulfide to acid precipitation will also be considered.

Water Resources

Effects on the quality, use, and availability of surface waters (marine and fresh) and groundwater from geothermal well drilling, disposal of liquid and solid wastes, construction of transmission lines, and installation of the submarine cable will be considered. Erosion and sedimentation, deposition of permitted air pollutants, permitted point and permissible non-point discharges from power plants and support facilities, radiological levels associated with brine impoundments, reinjection and/or impoundment of geothermal fluids/brine, all as a result of normal operation, will be considered. The EIS also will consider the risks of certain accidents associated with water resources, such as well blowouts, and with spills of hazardous or toxic materials.

Ecological Resources

The effect on habitats and indigenous species of atmospheric emissions, effluent discharges, waste disposal, electromagnetic fields, and noise associated with the HGP will be considered. Such habitats include the Wao Kele O Puna rainforest, wetlands, coral reefs, the marine water column, especially the benthic community, and the commercial fisheries in the Hawaiian Islands. Federal- and State-protected aquatic species include the humpback whale, which has seasonal calving grounds in Hawaii, the hawksbill and green sea turtles, and the Hawaiian monk seal. Numerous protected bird species and the protected hoary bat are found in the vicinity of planned development.

Geologic Issues

Hazards associated with development of the geothermal resource on the site of an active volcano will be considered. The effects of geothermal well drilling, production, and reinjection on regional seismicity and local subsidence will be examined. The effect of well development and construction on soils, agriculture, and paleontolcgical resources in areas proposed for development will be considered. Geothermal fluid withdrawal, reinjection, and the potential for resource depletion will be examined. Underwater and oceanic geologic hazards, such as tsunamis and landslides, and their subsequent effects on cable reliability and function will also be considered.

Noise

Increased ambient sound levels may result from well drilling, construction

equipment and machinery operation, and well venting. The effects of such levels on residents in nearby developments will be considered, including any adverse effects on occupational and public health. The effect of elevated sound levels on wildlife reproductive capabilities and susceptibility to predation will be considered as well.

Health and Safety

Health and safety issues will be considered associated with the following: (1) Well blowout; (2) exposure to gaseous emissions from power plant operation, especially hydrogen sulfide and radon gases and trace elements/compounds, such as arsenic, boron, selenium, and benzene; (3) elevated ambient sound levels; and (4) evacuations of nearby residences because of well venting or hydrogen sulfide releases.

Socioeconomic Issues

Issues that will be considered include those associated with the effects of population growth stimulated by additional power production, such as effects on public services, education, taxes, property values, insurance rates, and the economy (in particular, tourism). Another issue is the cost of the HGP compared to other alternatives.

Cultural Resources

Construction on land and at sea and plant operations may affect historic, archeological, and cultural resources such as native Hawaiian religious practices and beliefs (e.g., worship of the goddess Pele), burial sites, subsistence hunting and gathering, ocean gathering and fishing rights, and homelands.

Visual Effects

Issues that will be considered include those related to clearing and development within a pristine environment, and the visual effects of industrial facilities, such as geothermal plants and transmission lines, which can, in turn, affect tourism, the economy, and native Hawaiian religious practices.

Scoping Meetings

DOE plans to conduct public scoping meetings to assist in identifying further potential environmental impacts associated with the HGP. The meeting schedule is as follows:

Hawaii–March 7, 1992, Pahoa High and Elementary School, 15–3038 Puna Road, Pahoa, Hawaii 96778, 2 p.m.-5:30 p.m. and 7 p.m.-10:30 p.m.

Maui–March 9, 1992, Maui County Council Chambers, 8th Floor, County Building, 200 S. High St., Wailuku, Hawaii 96793, 2 p.m.-5:30 p.m. and 7 p.m.-10:30 p.m.

Molokai–March 12, 1992, Mitchell Pauole Center, 90 Ainoa Street, Kaunakakai, Hawaii 96748, 2 p.m.-5:30 p.m. and 7 p.m.-10:30 p.m.

Oahu–March 14, 1992, Roosevelt High School, 1120 Nehoa St., Honolulu, Hawaii 96822, 2 p.m.-5:30 p.m. and 7 p.m.-10:30 p.m.

Hawaii–March 16, 1992, Hawaiian Homes Meeting Hall, P.O. Box 125, Kamuela (Waimea), Hawaii 96743, 2 p.m.-5:30 p.m. and 7 p.m.-10:30 p.m. Location: The 55 miles marker Mamalahoa Highway, east edge of Waimea.

These meetings are intended to afford the public an opportunity to offer suggestions as to the scope and content of the EIS. There will be afternoon and evening meetings at each location. Individuals may speak at any one of the meetings, and should note their preference for speaking at either the afternoon or evening session. Those who do not register in advance to speak may register at the public meeting, and they will be afforded an opportunity to speak after preregistered speakers as time allows. On-site registration will begin one hour before each meeting. Requests to speak at any of the meetings should be directed to:

Thelma Patton, Oak Ridge National Laboratory, P.O. Box 2008, Building 4500N, Oak Ridge, TN 37831–6200, Telephone: (615) 574–6096, Facsimile: (615) 574–5788

or, in Hawaii: U.S. Department of Energy, Pacific Site Office, Prince Kuhio Building, rm. 4322, 300 Ala Moana Blvd., Honolulu, HI 96813, Contact: Irene Asato, Telephone: (808) 541–2581, Fax: (808) 541–2562

and should be postmarked no later than March 2, 1992. Letters should be sent via air mail.

A presiding officer will be designated by DOE for the scoping meetings, which will not be conducted as evidentiary hearings, and there will be no questioning of the speakers. However, the presiding officer may ask for clarification of statements to ensure that the comments are fully understood. The presiding officer will establish the order of speakers, which most likely will be public officials first followed, in turn, by group representatives and individuals. The presiding officer will provide any additional procedures necessary for the conduct of the meetings. To ensure that all persons wishing to make a presentation are given the opportunity, a 5-minute limit will be enforced for each speaker, with the exception that public officials and representatives of groups will be allotted 10-minutes each. Speakers will be limited to one presentation at one of the five scoping meetings. Speakers who wish to provide further information for the record should submit such information to: Dr. Lloyd Lewis, CE–121, Office of Conservation and Renewable Energy, U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585, Telephone: (202) 586–6283 and postmarked by April 15, 1992, to ensure consideration. Late comments will be considered to the extent practicable.

DOE reserves the right to change dates, times, locations of meetings, and the procedures for conducting the meetings, if necessary. Notification of changes will be announced in the local media.

DOE will prepare transcripts of all scoping meetings after their completion. The public may review transcripts and other HGP EIS references at the following locations:

Department of Business, Economic Development & Tourism, Library, 220 South King Street, Fourth Floor, Honolulu, Hawaii 96804, Contact: Anthony Oliver, Telephone: (808) 586–2425, Fax: (808) 586–2452.

Department of Business, Economic Development & Tourism, Hilo Office, Century Building, 80 Pauahi Street, room 207, Hilo, Hawaii 96720, Contact: Michelle Wong-Wilson, Telephone: (808) 933–4600, Fax: (808) 933–4602.

Department of Business, Economic Development & Tourism, Information Office, 220 South King Street, suite 1100, Honolulu, Hawaii 96813, Contact: Norman Reyes, Telephone: (808) 586–2405 or 586–2408, Fax: (808) 586–2427.

Department of Business, Economic Development & Tourism, Geothermal Office, Financial Plaza of the Pacific, 130 Merchant Street, suite 1060, Honolulu, Hawaii 96813, Contact: Maurice Kaya, Telephone: (808) 587–3812, Fax: (808) 587–3820.

Department of Business, Economic Development & Tourism, Energy Division, Publications Section, 335 Merchant Street, room 110, Honolulu, Hawaii 96813, Contact: Steven Kam, Telephone: (808) 548–4090 Fax: (808) 531–5243.

Hana Public and School Library, Hana Highway, Hana, Hawaii 96713, Contact: Jeremy Kindred, Telephone: (808) 248–77[illegible] Fax: (808) 248–7438.

Hawaii State Library, Hawaii Document Center Unit, 634 Pensacola Street, Honolulu, Hawaii 96814, Telephone: (808) 586–3535, Fax: (808) 586–3584.

Hawaii Energy Extension Service, Hawaii Business Center, 99 Aupuni Street, room 214, Hilo, Hawaii 96720, Contact: Andrea Beck, Telephone: (808) 933–4558, Fax: (808) 933–4602.

Hilo Public Library, 300 Waianuenue Avenue, Hilo, Hawaii 96721–0647, Contact: Claudine

Fujii. Telephone: (808) 953–5407. Fax: (808) 933–4658.
Kahuku Public and School Library, 56490 Kam Highway, Kahuku, Hawaii 96731. Contact: Jean Okimoto. Telephone: (808) 293–9275. Fax: (808) 293–5115.
Kahului Public Library, 90 School Street, Kahului, Hawaii 96732. Contact: Lani Scott Telephone: (808) 877–5048. Fax: (808) 871–9032.
Kailua-Kona Public Library, 75–138 Hualalai Road, Kailua-Kona, Hawaii 96740. Contact: Irene Horvath. Telephone: (808) 329–2196. Fax: (808) 326–4115.
Kauai Office of Economic Development, 4444 Rice Street, room 230, Lihue, Hawaii 96766. Contact: Glenn Sato. Telephone: (808) 245–7305. Fax: (808) 245–6479.
Lihue Public Library, 4391–A Rice Street, Lihue, Hawaii 96766 Contact: Karen Ikemoto. Telephone: (808) 245–3617. Fax: (808) 246–0159.
Maui Energy Extension Service 200 South High Street, Wailuku, Hawaii 96793. Contact: Kalvin Kobayashi. Telephone: (808) 243–7832. Fax: (808) 243–7870.
Molokai Public Library, Ala Maloma Street, Kaunakakai, Hawaii 96748. Contact: Sri Tencate. Telephone: (808) 553–5483. Fax: (808) 553–5958.
Mountain View Public and School Library, Highway 11, Mountain View, Hawaii 96771. Contact: Evelyn Garbo. Telephone: (808) 968–6300 Fax: (808) 968–6056.
Pahala Public and School Library, Pakalana Street, Pahala, Hawaii 96777, Contact: Lisa Cabudol. Telephone: (808) 928–8032. Fax: (808) 928–8199.
Pahoa Public and School Library, 15–3038 Puna Road, Pahoa, Hawaii 96778. Contact: Laura Ashton. Telephone: (808) 965–8574. Fax: (808) 965–7170.
Pearl City Public Library, 1138 Waimano Home Road, Pearl City, Hawaii 96782. Contact: Marilyn Van Gieson. Telephone: (808) 455–4134. Fax: (808) 458–4407.
U.S. Department of Energy, Freedom of Information Public Reading Room, room 1E 190, 1000 Independence Ave., SW., Washington, DC 20585, Contact: Mr. Ed McGinnis. Telephone: (202) 586–6020. FTS: 896–6020.
U.S. Department of Energy, Pacific Site Office, Prince Kuhio Building, room 4322, 300 Ala Moana Blvd., Honolulu, Hawaii 96813 Contact: Eilieen Yoshinaka. Telephone: (808) 541–2563. Fax: (808) 541–2562.
U.S. Department of Energy, San Francisco Field Office Public Reading Room, 1333 Broadway, Oakland, CA 94612. Contact: Ms. Estella Angel. Telephone: (510) 273–4428 FTS: 536–4428.
Waimanelo Public and School Library, 41–1320 Kalanianaole Highway, Waimanalo, Hawaii 96795. Contact: Nina O'Donnell Telephone: (808) 259–9925. Fax: (808) 259–8209.

Signed in Washington, DC, this 11th day of February, 1992, for the U.S. Department of Energy.

Paul L. Ziemer,

Assistant Secretary, Environment, Safety and Health.

[FR Doc. 92–3644 Filed 2–13–92; 8:45]

BILLING CODE 6450–01–M

Financial Assistance Award; Keystone Center

AGENCY: Department of Energy.

ACTION: Notice of unsolicited financial assistance award to the Keystone Center.

SUMMARY: The Department of Energy (DOE) announces that pursuant to 10 CFR 600.14(e)(1)(i), it is making a financial assistance award based on an unsolicited application under grant number DE–FG01–92PE79105. The grant is to determine the different positions of interest groups on key issues and to narrow the difference through dialogues. This effort will have a total estimated cost of $60,000 (cost sharing) to provided by DOE.

SCOPE: The grant will provide funding to the Keystone Center to select a working group of experts from affected constituents to discuss clarification and resolution of present uncertainties concerning Federal and State jurisdiction in the economic regulation of electric utilities and to address the subject of utility planning using least cost principles.

The project is meritorious because of its relevance to the accomplishment of an important public purpose—development of consensus on critical issues concerning the existing allocation of State/Federal regulatory authority to (1) govern evolving bulk power markets, and (2) provide the consumer with necessary energy services through utility planning based on least-cost dialogue that can be translated into legislation or regulatory policy.

ELIGIBILITY: Based on the evaluation of relevance to the accomplishment of a public purpose, it is determined that the proposal represents an innovative method and approach to determine the different positions of interest groups on key issues and to narrow the difference through dialogue. The proposed project represents a unique idea that would not be eligible for financial assistance under a recent, current, or planned solicitation.

FOR FURTHER INFORMATION CONTACT: Please write the U.S. Department of Energy, Office of Placement and Administration, ATTN: Mary Braxton, PR–321.1, 1000 Independence Ave, SW., Washington, DC 20585.

Jeffrey Rubenstein,

Director, Operations Division "A", Office of Placement and Administration.

[FR Doc. 92–3645 Filed 2–13–92; 8:45 am]

BILLING CODE 6450–01–M

Federal Energy Regulatory Commission

[Project Nos. 10944–002, 10962–001, 10963–001, 10964–001, 11127–001, 11172–001, 11173–001, 11198–001 Oregon]

Portland General Electric Co.; Surrender of Preliminary Permits

Dated: February 7, 1992

Take notice that Portland General Electronic Company, Permittee for the following projects has requested that its preliminary permits be terminated.

All projects would have been located within the Mount Hood National Forest, in Clackamas County, Oregon.

Project No.	Project name	Creek name	Issued	Expires
10944–002	Cripple Creek	Cripple Creek	10/29/90	9/30/93
10962–001	Timothy Lake	Arnal Creek, Stone Creek	01/28/91	12/31/93
10963–001	South Fork Cripple Creek	South Fork Cripple Creek	10/31/90	09/30/93
10964–001	Bull Creek	Bull Creek	10/30/90	09/30/93
11127–001	Cot Creek	Cot Creek	06/28/91	05/31/94
11172–001	Deer Creek	Deer Creek	01/22/92	12/31/94
11173–001	Dinner Creek	Dinner Creek	01/23/92	12/31/94
11198–001	Three Lynx Creek	Three Lynx Creek	01/23/92	12/31/94

The Permittee filed the request on January 21, 1992, and the preliminary permits shall remain in effect through the thirtieth day after issuance of this notice unless that day is a Saturday, Sunday or holiday as described in 18 CFR 385.2007, in which case the permit shall remain in effect through the first business day following that day. New applications involving these project sites, to the extent provided for under 18

APPENDIX G

CONTRACTOR DISCLOSURE STATEMENTS

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF ENVIRONMENTAL IMPACT STATEMENT FOR THE HAWAII GEOTHERMAL PROJECT

CEQ Regulations at 40 CFR 1506.5 (c), which have been adopted by the DOE (10 CFR 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" for purposes of this disclosure is defined in the March 23, 1981, guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations", 46 FR 18026-18038 at Question 17a and b.

"Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)". 46 FR 18026-18038 at 18031.

In accordance with these requirements, Martin Marietta Energy Systems, Inc. (COMPANY NAME) hereby certifies as follows: check either (a) or (b),

(a) [X] Martin Marietta Corp. (COMPANY NAME) has no financial or other interest in the outcome of the Hawaii Geothermal Project.

(b) [ ] _____ (COMPANY NAME) has the following financial or other interest in the outcome of the Hawaii Geothermal Project and hereby agrees to divest itself of such interest prior to initiating any technical analyses in support of this Project.

Financial or Other Interest

1.

2.

3.

Certified by:

SIGNATURE

Gary J. Draper
NAME

Manager, Contracts
TITLE

May 27, 1992
DATE

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF ENVIRONMENTAL IMPACT STATEMENT FOR THE HAWAII GEOTHERMAL PROJECT

CEQ Regulations at 40 CFR 1506.5 (c), which have been adopted by the DOE (10 CFR 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" for purposes of this disclosure is defined in the March 23, 1981, guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations", 46 FR 18026-18038 at Question 17a and b.

"Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)". 46 FR 18026-18038 at 18031.

In accordance with these requirements, Energy, Environment + Resource Center, Univ. of Tennessee (COMPANY NAME) hereby certifies as follows: check either (a) or (b),

(a) ☒ Energy, Environment + Resource Center (COMPANY NAME) has no financial or other interest in the outcome of the Hawaii Geothermal Project.

(b) ☐ _____ (COMPANY NAME) has the following financial or other interest in the outcome of the Hawaii Geothermal Project and hereby agrees to divest itself of such interest prior to initiating any technical analyses in support of this Project.

Financial or Other Interests

1.

2.

3.

Certified by:

Jack Barkenbus
SIGNATURE

JACK BARKENBUS
NAME

Acting Director
Energy, Environment + Resource Center
TITLE

May 28, 1992
DATE