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9/18/92

DOE REVIEW DRAFT

Comprehensive Summary and Analysis of Oral and Written Scoping Comments on the Hawaii Geothermal Project EIS

Compiled by
The U.S. Department of Energy
Office of Conservation and Renewable Energy

September 18, 1992

U.S. Department of Energy
Washington, D.C.

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PREFACE

This report contains summaries of the oral and written comments received during the scoping process for the Hawaii Geothermal Project (HGP) Environmental Impact Statement (EIS). Oral comments were presented during public scoping meetings; written comments were solicited at the public scoping meetings and in the *Advance Notice of Intent* and *Notice of Intent* (published in the *Federal Register*) to prepare the HGP EIS. This comprehensive summary of scoping inputs provides an overview of the issues that have been suggested for inclusion in the HGP EIS.

Listed in the table below are the public scoping meetings that the Department of Energy (DOE) held at five locations in Hawaii. The public scoping meetings were held in compliance with Council on Environmental Quality regulations (40 CFR 1501.7) and DOE National Environmental Policy Act (NEPA) Guidelines (52 *Fed. Regist.* 47664, December 1987). Also,

Give cite

HGP EIS scoping meetings in Hawaii

Location	Date and time
Pahoa (Big Island)	March 7, 1992 Meeting 1, 2:00 p.m. Meeting 2, 7:00 p.m.
Wailuku (Maui)	March 9, 1992 Meeting 1, 2:00 p.m. Meeting 2, 7:00 p.m.
Kaunakakai (Molokai)	March 12, 1992 Meeting 1, 2:00 p.m. Meeting 2, 7:00 p.m.
Honolulu (Oahu)	March 14, 1992 Meeting 1, 2:00 p.m. Meeting 2, 7:00 p.m.
Kamuela/Waimea (Big Island)	March 16, 1992 Meeting 1, 2:00 p.m. Meeting 2, 7:00 p.m.

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.

About 170 people provided approximately 700 comments during scoping meetings. In addition, approximately 70 people submitted materials and letters to DOE during the scoping

period (before the April 15, 1992, deadline). 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.

During the scoping meetings, a court recorder transcribed all oral comments and compiled transcripts of the proceedings. These transcripts may be reviewed at DOE Reading Rooms and other locations identified in the *Federal Register* notices. The DOE Reading Rooms are listed below.

**DOE Reading Rooms with Copies of the
HGP EIS Public Scoping Meeting Transcripts**

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

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 Energy Extension Service
200 South High Street
Wailuku, HI 96793
Contact: Calvin Kobayashi
Telephone: (808) 243-7832
Fax: (808) 243-7870

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) 587-3812
Fax: (808) 587-3820

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

Oahu (continued)

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

Waimanalo Public and School Library
41-1320 Kalaniana'ole 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

ORAL COMMENTS

PUBLIC SCOPING MEETINGS

2 written comments

- ✓ collect all CA inputs
- ✓ in one place - list by agency
- ✓ also other agencies (i.e. EPA)
- ✓ add responses to Ziemer ltr 2/5/92
- ✓ add clip/skip coupon response
- ✓ mention mail list + responses to written submissions
- ✓ arrange by issue, not commenter
- ✓ delete names except agencies
- ✓ combine rough notes so all comments from one individual are together
- ✓ if written input duplicates oral (i.e. is sing's transcript) - don't double count
- ✓ where do counts on comments come from
- ✓ Seems like some ^(many?) missing
 - R. Mowris
 - NW Economic Assoc
 - True Mid Pacific
 - any others?
- ✓ Do an actual accounting - list by name for comparison to DOE files
- ✓ Native Hawaiian translations?
- ✓ Priority scoping comment reviews - unchanged or modified from what commentor saw

EIS SCOPING MEETINGS, HAWAII GEOTHERMAL PROJECT

March 7, 1992, Pahoa, Hawaii; March 9, 1992, Wailuku, Maui;
March 12, 1992, Kaunakakai, Molokai; March 14, 1992, Honolulu, Oahu;
and March 16, 1992, Waimea, Hawaii

1. PURPOSE AND NEED

Nearly 20% of those presenting comments 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.

Several presenters 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 passed.

In questioning the objectives of the HGP, commenters noted that planning for the development of 500 MW 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 due to increased power availability, tourism's reliance on oil for transportation may increase Hawaii's dependency on oil.

2. PROPOSED ACTION

2.1 DEFINITION OF PROJECT

About 15% of the commenters wanted a better definition of both phases of the HGP.

The EIS should clearly delineate the federal and State's participation in the HGP. It was noted that in order for 500 MW 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.

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

2.2 RESOURCE CONCERNS

Some commenters were concerned that the magnitude of the resource in the Kilauea East Rift Zone has not been verified. The EIS should discuss the reliability and renewability of the resource (~15% of the commenters). The EIS should investigate the effect of the need for expansion into additional land as the resource declines.

2.3 GEOTHERMAL PROJECT RELIABILITY

The EIS should discuss the reliability of the geothermal power generation facility

(>25% of those presenting), 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, the EIS should 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.

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.

2.3.1 Mitigation Methods

Proposed and alternative abatement and mitigation measures should be described and their potential impacts identified and assessed, including: best available control technologies, measures to prevent invasion of exotic 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.

2.4 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. Twenty percent of the 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 increased depreciation of material and lowered property values and that community and individual rights have been violated.

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.

2.5 CABLE/TRANSMISSION LINES

The EIS should describe the submarine cable, the transmission lines, pumping stations and other infrastructure, their reliability, and

efficiency (~20% of those presenting). It should identify the primary and alternative route. Those presenting suggested that the EIS should address impacts associated with cable/transmission line installation, operation, maintenance, and failure. They asked if the submarine cable was technically/economically feasible and reliable (in terms of placement, operation and maintenance), considering the depths, bottom roughness, frequency of debris flows, and extreme oceanic conditions in the Alenuihaha Channel. Similarly, they asked about: the reliability of the system if it were subjected to a seismic or volcanic event; the implications of possible sabotage of the cable; whether shark bites or ship anchors will damage the cable; and if the grid on Hawaii can safely distribute the power associated with HGP. They expressed concern that parallel transmission lines along the Kea'au road makes the system vulnerable [to seismic events, volcanic events, extreme events (storms), sabotage]. They noted that if lines are broken, any escape route from Puna could also be cut off. The EIS should outline repair strategies and state how long repairs will take.

2.6 FUTURE USES

About 15% of the presenters 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.

The comments suggested 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 was in place, that other power generation facilities could use the cable as a conduit; in fact, laying of the cable could make construction of other energy-production facilities economically feasible.

3. ALTERNATIVES TO THE PROPOSED ACTION

Nearly 50% of the comments 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. The EIS should examine their technical and economic feasibility/reliability, and their environmental impacts. These include "no action," fossil fuel options (coal gasification), conservation and renewables, and various geothermal options. They should be considered within the framework of integrated resource planning 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).

3.1 CONSERVATION AND RENEWABLES

Nearly 40% of the 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 (OTEC), 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.

3.2 GEOTHERMAL ALTERNATIVES

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

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

3.3 ALTERNATIVES TO THE CABLE AND TRANSMISSION LINES

Alternatives to transmission lines should 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 route (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 Lana'i with spur lines to Lahaina and Molokai'i and direct line from Lanai to Oahu; or routing the cable directly to Oahu, not landing on Maui. 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. Prior to development of the HGP plus cable a smaller demonstration should be conducted to determine whether power transmission to other islands is reasonable.

3.4 TRANSPORTATION

The EIS should examine reducing Hawaii's dependence on petroleum-based fuels for transportation (for example, using fuel-efficient automobiles) in order to reduce Hawaii's dependence on imported oil. The EIS should examine the potential contributions of alternative transportation fuels, providing on-site or near-site employee housing, alternative methods for interisland travel. However, the EIS should examine the costs associated with supplying an unneeded mass transit system on Oahu to save energy.

3.5 FOSSIL FUEL

The EIS should 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.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

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, local meteorology, natural (ambient) emissions, and geothermal emissions, fluids, and solid wastes. Surveys of the biota in the Kilauea East Rift Zone region and all the proposed overland and undersea transmission corridors should be carried out and the archeological sites on the southeastern coast of Maui should be analyzed.

5. POTENTIAL ENVIRONMENTAL ISSUES

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 Moloka'i, and the marine environment. The EIS should not only consider local impacts, but should take a planetary or global perspective. 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. 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. 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 HGP on plants and animals used for medicinal and ritual purposes by Native Hawaiians (The 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. The EIS should describe measures that would be used to assure that herbicides used to prevent invasion of exotic 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.

The EIS should establish whether the clearing of land for 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 archeological concerns).

5.1 COMPETING USES

Nearly 30% of those commenting 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.

The EIS should also address the impacts of the HGP on water availability and water uses. The EIS should 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. 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.

The EIS should 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.

5.2 AIR QUALITY CONCERNS

More than 20% of the presenters recommended that the EIS characterize the emissions associated with the 500 MW 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 Moloka'i. Geothermal emissions can affect the water quality in catchment systems, commonly used in Puna for drinking and bathing.

5.3 WATER QUALITY ISSUES

Nearly 25% recommended that the EIS characterize the effluents and the brine ponds associated with the 500 MW 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. The EIS should address impacts of the HGP on drinking water quality (particularly in water catchments), 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.

5.4 ECOLOGICAL RESOURCES

Nearly 50% of the presenters 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, land-based aquatic, or marine ecosystems and the threatened, endangered and endemic species therein and on humans. Many have been discussed in the introduction to Section 5.

5.4.1 Impacts to Terrestrial and Land-based Aquatic Ecosystems

In addition to the concerns mentioned in the introduction to Section 5, 25% of the commenters recommended that the EIS should address the potential impacts of the HGP on unique species, for example insects, that live in lava tubes.

5.4.2 Rain Forest Issues

Nearly 30% of those commenting expressed concern for the rain forest. 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 exotic species, extensive segmentation caused by building roads and clearing areas, and incursions of humans. The EIS should also 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.

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.

5.4.3 Threatened, Endangered, or Endemic Species Concerns

Nearly 20% of the presenters were concerned about the potential impacts of the HGP on threatened, endangered, and endemic species, particularly in the rain forest of Puna, the dry forest on Maui, and in the

ocean. Species mentioned include humpback whales (particularly nursing mothers and their offspring), sea turtles, ohia, happy-face spider, Hawaiian hawk, and hapu'u (tree fern). 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 speaker stated that he believed that if there were "take," even inadvertent, in a federally-funded project then the project would be stopped. Another commenter asked what happens if species become extinct as a result of HGP?

5.4.4 Marine Concerns

Nearly 20% of the commenters requested that the EIS should investigate the impacts of the submarine cable installation and maintenance (increased turbidity, possible ciguatera, and increased noise levels), normal operation (emf, stray voltage, 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; and on beaches, surfing locations, and reefs; and on ecology in the coastal zone.

The EIS should investigate the impacts of the cable on humpback whale migration patterns, birth rate, and 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. The EIS should investigate the impacts the HGP would have on fisheries and should consider the impacts of the cable (e.g., installation, operation, maintenance) on the reefs and fish ponds.

5.5 GEOLOGICAL 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.

5.6 AESTHETIC ISSUES

The EIS should 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.

5.7 HEALTH AND SAFETY ISSUES

The EIS should assess the health and safety impacts of the HGP and its components, failures, mitigation measures, and future uses (more than 40% of those presenting).

5.7.1 Geothermal Emissions and Effluents

About 25% of the commenters expressed concerns about the potential health effects of geothermal emissions (particularly H₂S and acid rain) and effluents, due to HGP-related changes in air, drinking water, and food quality. These effects can include eye, throat irritation, and noise irritation, trouble breathing, 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.

5.7.2 Transmission Line Effects

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.

5.7.3 Noise

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 and cause fear, loss of sleep, and psychological stress.

5.7.4 Psychological Impacts

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 (for example, children and Native Hawaiians) and cross-cultural psychological issues.

5.7.5 Safety, Civil Defense 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 should occur 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.

The EIS should address the impacts of the violence that might occur should the HGP proceed.

With respect to the submarine cable, the EIS should: 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. 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.

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. The EIS analysis should consider the fact that the HGP may cause increased population, which would (along

with drought conditions which do occur on the Big Island) further exacerbate the problems mentioned above.

5.8 POLITICAL ISSUES

Fifty percent of the 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.

The 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 H₂S. They asked if regulations have been violated in the past, are they currently being violated and will they be in the future?

The EIS should 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).

5.9 SOCIOECONOMIC ISSUES

Almost 75% of those commenting expressed concern about the long- and short-term socioeconomic impacts of the HGP detailed below.

5.9.1 Economic Issues

Nearly 40% of the commenters 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. It should 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. The EIS should identify who would be responsible for the consequences of lower property values or property condemnation.

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.

The EIS should identify who is liable—the federal government, the State, and/or privately-owned corporations—for all costs incurred and should mandate that conditions of permits should include future liability clauses. The EIS should identify means to provide insurance for those whose property values (etc.) decline or are forced to move due to the HGP.

The EIS should consider the impacts of diverting funds that could be spent on conservation technologies to the geothermal effort. 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 save the costs of constructing and updating additional generation/transmission facilities.

5.9.2 Life Style

The EIS should address impacts of the HGP on the life styles of the general population, specifically on Native Hawaiians. They asked if the cable/transmission lines will affect, for instance, subsistence life styles, 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).

5.9.3 Social Issues

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 HGP. It should identify and assess the socioeconomic costs due to a decline in resource after 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.

5.9.4 Native Hawaiian Issues

Nearly 50% the commenters were concerned that the EIS respect Native Hawaiian race, rights, religion, history, language, and culture. Many expressed the belief that geothermal development would result in a desecration of Pele.

The commenters 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 life style); 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, heiaus, and other places sacred to Native Hawaiians. The EIS should 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).

The EIS should 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 kupunas, and Hula dancers, in order to investigate the impact the HGP would have on cultural practices.

5.9.5 Impacts to Cultural Resources (Archeological/Historical Sites and Regions)

Several speakers indicated that the EIS should assess potential impacts to the many important, and often undocumented,

archeological and historical sites and regions, including the southeast coast of Maui, the south coast of Moloka'i, and North Kohala.

6. COST BENEFIT ANALYSIS

Nearly 30 % of the commenters declared 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.

7. LEGAL ISSUES

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.

The EIS should 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. The EIS should examine the complex regulatory situation with respect to land use and geothermal subzone designation.

WRITTEN COMMENTS

LETTERS RESULTING FROM THE PUBLIC SCOPING MEETINGS AND RESPONSES TO THE ANOI AND NOI

INTRODUCTION

No order
No structure
Not a summary like verbal

Written scoping comments were received following issuance of the Advance Notice of Intent and the Notice of Intent. These consisted of letters, often with numerous enclosures, and written comments submitted at or following the scoping meetings. Many commenters failed to sign their submissions or include any indication of the source of information provided. An attempt has been made to acknowledge receipt of all written comments and to accurately summarize those comments regardless of their source.

Letter from Sherrie Moore, April 13, 1992

Concern about venting of geothermal wells. She believes the June 1991 blowout caused many illnesses which citizens feel have not been given due consideration because diagnoses were not made according to scientifically rigorous methods. Continued efforts to develop geothermal resources do not take into account costs to citizens.

Testimony from Maui Tomorrow, March 9, 1992

Group shares the concern of many Big Islanders regarding health effects of geothermal emissions and problems of proximity of residential areas to wells. There is also a concern about segmenting the rain forest and the aesthetic impact of transmission towers to pristine coastline. Asks consideration to alternative to towers.

Global Environmental letter, April 14, 1992

EIS should consider conservation alternatives; cumulative impacts should be addressed; consideration needed for linkages between growth and cumulative issues; gives information about Global Environmental for consideration in contract involvement.

Information pack from the Kapoho Community Association, March 7, 1992

Included in this pack is EIS scoping testimony presented on 3/7/92 by the Kapoho Community Association: Lists persons who should not be on the EIS evaluation team and why. Criticizes HGP-A EA for failing to identify potential significant adverse environmental effects that eventually resulted from that project. Suggests new geochemical tests for all wells. Suggests using field studies for noise attenuation rather than theoretical calculations. Similar suggestion for meteorological data. EIS should address cumulative effects of VOG and project emissions, worst case scenario hazard analysis of blowouts (with chronic and acute effects), review applicable statutes for adequacy in protecting the environment, and investigate groundwater.

Letter from Native Hawaiian Advisory Council, April 28, 1992

Comments regarding water rights issues, state permitting procedures, and Native Hawaiian religion. The surface water and groundwater in Puna District are sacred to Native Hawaiians. Construction of the plant would make portions of these waters unavailable for religious activities.

Information
Pele Defense Fund Agenda for Scoping Meeting, March 7, 1992

Comments address Native Hawaiian religion, cultural practice, and sovereignty issues. Native Hawaiian worship of the goddess Pele would be seriously impaired by geothermal development. Consider coverage of Native Hawaiian rights under the 1st Amendment and under the American Indians Religious Freedom Act (AIRFA). The State should justify its position regarding the "overriding or compelling need" for the project. The EIS should carefully consider the cumulative impacts of the proposed HGP (e.g., the history of events and legal proceedings) and the impacts of the proposed project on a sensitive ecological system (the rain forest).

Letter from Robert E. Bethea, April 30, 1992

Letter recommending objective analysis of activists' anti-development position. The potential impact of geothermal development on Pele and traditional worship practices associated with Pele is a recently stated concern, one that is relatively insignificant. Suggests objectively evaluating the position adopted by activists opposed to geothermal development on cultural grounds in light of the overall public good.

Letter from Ian Bowman, April 25, 1992

Letter questioning significance of activists' claims regarding geothermal development. The potential impact of geothermal development on Pele and traditional worship practices associated with Pele is a recently stated concern, one that is relatively insignificant according to Mr. Bowman. Suggests objectively evaluating the position adopted by activists opposed to geothermal development on cultural grounds in light of the overall public good.

Letter from Lisa Hamilton, with attachments, April 9, 1992

Provides advice on developing physical scope, environmental and cultural issues, land use issues pertinent to island of Maui. Suggests specific examples on Maui of historic and prehistoric linear sites (trails and archaeological complexes). Discusses zoning implications for changes in land use and the need for a more fully developed land-use policy. Is concerned about damage to fish, wildlife, and natural resources in general. This EIS effort should be coordinated with related State and federal EISs (e.g., the Dept. of Interior's 1973 Final EIS for the geothermal leasing program). Input from knowledgeable residents should be incorporated into the study (e.g., recommendations on the best cable crossing route and transmission line routes for southern Maui).

Native Hawaiian Advisory Council (NHAC), written scoping comments.

Impacts of the HGP could be physical, socio-economic, cultural, and spiritual. The EIS should address water resource protection, water quality, and the allocation of water to land uses. Appropriate permitting procedures and variances for geothermal water source development should be determined, clearly addressing emergency conditions. Recommends that the State include geothermal source development in its treatment of water resource protection and adopt appropriate procedures.

Letter from State Senator Andrew Levin to William W. Paty, Jr., Department of Land & Natural Resources, March 27, 1992.

Based on a newspaper article, complains of high noise levels during drilling activities. Wants the Department to rescind present

permit and issue a new one with more stringent requirements on noise.

Letter from J. Perry to Department of Land and Natural Resources, March 13, 1992.

Requests information on results of a safety inspection, copies of drilling reports and monitoring of test results for an injection well, and a copy of the permit for that well.

Office of Planning
Fax from Kal Kobayashi, Planning Director, County of Maui, April 14, 1992.

The Planning Department of Maui accepts the invitation to participate as a Cooperating Agency in the HGP EIS process.

Planning Department's views on the topics specified in the letter of invitation (dated February 5, 1992).

1. The issues identified so far by DOE are a good starting point and consideration should be given to additional issues.
2. Additional project-related issues of importance are:
 - Impacts of the overland transmission corridor.
 - Impacts to the reef and fishpond resources along the south shore of Molokai.
 - Impacts to the Island of Lanai.

Testimony by Annie Szvetcz, Hawaii Campaign Coordinator Representing Greenpeace and the Rainforest Action Network

The EIS should include a complete evaluation of Phase 3, including the True and PGV projects, because Phase 3 is a "state-federal-private" development and is considered the "final, critical phase" of the project in which completion of 25 commercial-scale wells would clear the way

for private construction of the full 500 MW system.

Potential environmental and socioeconomic impacts that should be addressed include, but are not limited to: (1) toxic air pollution from emissions of hydrogen sulfide, chlorides, radon, and heavy metals in steam condensate (effects include serious physical, emotional, and financial harm); (2) noise pollution; (3) coastal and groundwater pollution; (4) geologic hazards from drilling and underwater transfer of electricity; (5) loss of biological diversity resulting from destruction of rain forests and coral reefs; (6) oil spills from oil-lined cables; (7) electromagnetic radiation; (8) violation of Native Hawaiian religious and land rights; (9) destruction of ancient archaeological sites; (10) increased energy costs; and (11) higher state taxes.

Comments that are specific to the rainforest: Rain forests are integral to planetary health, and of paramount importance to global species diversity and climate control. In 1981, Wao Kele O Puna was included in the Natural Area Reserve System, the most highly protected status in the state. The purpose was to "preserve for present and future generations a representative ohia-fern forest ecosystem much as it existed before the arrival of Captain Cook." Lava flows in the Kahauale'a, owned by Campbell, resulted in the change in designation as a buffer to protect Wao Kele *downrift* from the geothermal resources to declaration of Wao Kele as a "junk forest" and its exchange with Campbell estate to protect the *uprift* rainforest. Property boundaries and profit-motives were recognized by DLNR rather than ecology in designation of land-use for the remaining lowland rainforest.

Specific categories of issues that should address the rainforest in the EIS are:

1. Impacts from direct clearing of vegetation for roads, power lines, exploratory and development wells, and power plants.

- a. Include an accurate estimate of forest to be cleared. Comment contains estimates for Hawaii, for Geysers, and HGP-A and actual amounts used to date. Use actual to date for Hawaii to project the amount of land that would be disturbed for 500 MW plant.
 - b. Address the corridor effect from road, pipeline, and powerline fragmentation as a direct impact which will result in the invasion of new alien species as previously inaccessible areas are opened by fragmentation to invasion.
 - c. Address impacts on the rainforest of herbicides used along the corridors.
 - d. Address the effects of direct forest destruction from poaching of Hapu'u native tree ferns and the potential for other destructive uses of the forest because of accessibility resulting from geothermal development.
2. Address the associated impacts on the entire Kilauea East Rift ecosystem which have been overlooked.
- a. Wao Kele O Puna represents an essential part of a successional ecosystem. The destruction of this forest should be evaluated as being a loss to global biological diversity.
 - b. Address the need to maintain Wa Kele O Puna intact because of the unique relationship between the lava flows and forest regeneration which defines this rainforest. The concept of "primary succession" leading towards a final "climax forest" is archaic and inappropriate for Wao Kele. The health of the forest is not defined by the number of pigs and guava trees, but by its ability to leave intact patches of its successional components which continues the cycle of lava flows and forest growth. Wao Kele is the only viable patch of native lowland forest left in Puna. Wao Kele is the key to native forest regeneration on Kilauea's new lava for generations to come.
3. Address the impacts on the cultural resources of this forest ecosystem which have also been left out of geothermal analysis.
- a. The ecological interrelationship between the land and the native Hawaiian people should be addressed. What is at stake is not just acres of land; it is the survival of a unique forest ecosystem and an indigenous culture within the U.S.
 - b. Address the relationship between land and power and how it relates to this development scheme.
- Lastly, the commenter asks, "Why were mining leases turned over to Ormat, enabling continued operations, when requirements leading to the shut-down of Ormat had not been met following uncontrolled venting?"
- Letter from Benjamin B. Lee, Chief Planning Officer, City and County of Honolulu, March 9, 1992.**
- Comments on economic cost to Oahu consumers of the transmission of electrical power. Also discusses land use impacts and visual effects of the installation of cable terminals and distribution facilities on Oahu.
- Letter from David A. Caccia, March 10, 1992.**
- The letter contains comments on the appropriateness of any massive source of electricity on the Big Island. Mr. Caccia favors species preservation.
- Letter from Eric S. Wagner, International Systems Maintenance, Submarine Cable Protection, AT&T, March 18, 1992.**
- The Deep Water Cable project should include the potential impact of the cable on the existing and future undersea network of submarine telecommunications.

Letter from Carla Deicke, March 16, 1992.

Testimony against the destruction of Wao Kele O Puna rain forest. Asserts that the introduction of non-indigenous plant species will destroy the native species and eliminate a scientific resource. Proposes energy conservation and alternatives.

Letter from Los Alamos Science Student Program c/o Alverton A. Elliot, March 10, 1992.

Student group concerned about geothermal's effect on ecosystems, wildlife, volcanic eruptions, air pollution, health and safety, depletion of underground reservoir water, ozone, and subsidence.

Letter from Paul F.N. Lucas, Staff Attorney, Native Hawaiian Legal Corporation, March 10, 1992.

Discussion and assessment of the Native Hawaiian religious and gathering claims and practices; focuses on the Puna District.

Letter from Fred Gladones, International Longshoremen and Warehouse Workers, Local 142, March 24, 1992.

The union supports development of geothermal energy for the Big Island and is concerned about the adequacy of power sources in Hawaii. It does not yet support the shipment of power to other islands.

Letter from Regina E. Gregory, March 26, 1992.

States the location of the geothermal plant in the nation's last lowland rainforest will destroy the forest and many threatened species. Other issues contested: noise and air pollution, accidents leading to uncontrollable venting, corrosion of drinking systems,

transmission corridor's effects on aesthetic resources, and marine life disruption.

Letter from Andrew Kier, March 21, 1992.

Mr. Kier states that his oral testimony at the public scoping meeting was on behalf of himself only and not the Big Island Rainforest Action Group (no scoping issue).

Letter from Toby Hazel, Puna Advisory Council, March 24, 1992.

Mitigations that include adequate assessment of the entire geothermal subzone and not each individual developer need to be taken into account. Other issues: worst case scenario should be extended to 4.1 miles, land use (industrial in rural area), loss of homes and crops, and emergency preparedness.

Letter from Brent Gallagher, March 24, 1992.

Questions increased power for additional development. Other issues: damage to quality of life through increase in population, traffic and pollution, and cooperation between developers and local government.

Letter from Ralph A. Patterson, R. A. Patterson & Associates, March 19, 1992.

compared
The association volunteers assistance to the HGP EIS (no scoping issues).

Letter from Karlton Tomomitsu, Stryker Weiner Associates, Inc., March 17, 1992.

Submits an article (by Mr. Dave McCoy, Chief Operating Officer, the Estate of James Campbell) that supports careful geothermal development compared with environmentally

harmful coal-fired electrical plants currently constructed on Oahu. Favors clean electricity from geothermal to save the environment.

**Letter from Pele Defense Fund,
March 2, 1992.**

Copy of a PDF advertisement opposing geothermal development: "1991: Blowout Year for Geothermal." Includes clip-and-ship coupons supporting efforts to "protect Native Hawaiians from geothermal destruction and cultural genocide."

Letter from Fred J. Koehnen, March 2, 1992.

Mr Koehnen is a supporter of geothermal development. Cost-benefit ratio of geothermal energy production vs relocation cost would be substantially in favor of such a development policy.

**Postcard from Elizabeth Ann Stone to U.S.
DOE, March 14, 1992.**

Opposes geothermal and suggests solar and wind forms as alternative resources.

**Letter from Don E. Carroll, Oceanic
Cablevision, March 18, 1992.**

Believes that geothermal power would help insulate local power costs from events that adversely affect the world's oil supply.

**Letter from Harold S. Masumoto, Director,
Office of [Hawaii] State Planning, March 2,
1992.**

Issues addressed include monitoring and remediation for effects of H₂S gases, acid rain effects on ecological resources, air quality, and concerns about changing land use.

**Letter from Alan Parolini, FB&D
Technologies, Inc., February 19, 1992.**

Requests copies of the HGP DEIS and FEIS for HGP when completed.

**Letter from Pat Wilde, Dept. of the Navy,
February 28, 1992.**

~~He~~ The Navy is concerned with maritime risks associated with deployment, operations, maintenance, and repair of the submarine power transmission cable, including cable failure, leaking, anchor snagging, fishing hazard, aesthetic concerns, and sediment transfer into the ocean.

**Letter from James V. Williamson, Consulting
Engineer, March 10, 1992.**

Concerned about Phases 1 & 2 not being completed, economics of alternatives, underestimation of number of necessary production wells, land use, air quality, water resources, geologic issues, H₂S emissions, health and safety, and socioeconomics.

Letter from L.A. Collins, Jr., March 13, 1992.

Discusses the inexperience of ORMAT and the disregard of developers and politicians for the health of the community.

**Letter from Bettie Van Overbeke,
March 10, 1992.**

Expresses concerns about health effects due to the June 12, 1991, PGV blowout. The blowout caused her fish pond to turn brown, the pH level dropped from 6.5 to 3.2, and there was a lack of electricity in the Kohana Beach Estates Subdivision.

**Letter from Carl H. Meierdiercks,
March 13, 1992.**

Requests the immediate delivery on line of the PGV-OESI and True-Pacific plants. Supports exploration of future geothermal potentials in Hawaii, especially the Big Island.

**Letter from Helene H. Hale, County
Councilwoman, County of Hawaii,
March 18, 1992.**

Discusses alternatives (i.e., OTEC, hydro and hydrogen production) and emergency plans. Submits that "bladeless turbine" technique should be considered. Also included a copy of a 2-28-92 memorandum from Harry Kim, Civil Defense, to Norman Hayashi, Planning Director, regarding Emergency Response Plan 6.1 GRP87-1C, Section 20 and 21 requirements.

**Letter from William and Rose Atkins,
February 29, 1992.**

Oppose geothermal due to: H₂S emissions, illness from minute gas leaks, geological instability and volcanic activity, land values falling, unsightly and hazardous power lines, loss of community well being, psychological harassment from HELCO, and local and state governments ignoring the pleas of the residents affected by the project.

Letter from William Merwin, March 12, 1992.

Opposes geothermal because of aesthetic concerns, negative effects of towers along the coast of Maui, hazards of drilling (i.e., toxins, brines), and destruction of the rain forest. Also included an article: G. Maranto, "A Tender of Trees: M. S. Merwin's Poetry and Politics," *The Amicus Journal*, Winter 1992.

Letter from D. Hunter Beyer, April 14, 1992.

Questions resource reliability/renewability, forest and native habitat losses, destruction of nature, socioeconomic and cultural costs, underwater cable effects on marine life. Suggests renewable resources are preferable.

**Letter from Cynthia K. Kanoholani,
April 10, 1992.**

Native Hawaiian religion and culture will be affected by drilling in a sacred region. Adverse impact on Hawaiians will be great.

Letter from Aileen Lum, April 13, 1992.

Implores the EIS not to be swayed into thinking there is widespread opposition to geothermal on the Big Island; there is strong quiet support.

**Letter from Sidney William Cook,
April 14, 1992.**

Believes there is support for geothermal on the Big Island, and the EIS should examine costs of geothermal development relative to alternatives and examine environmental costs. Also submits allegations of corruption.

**Letter from Rich Von Wellsheim,
April 14, 1992.**

A Kipahulu Community statement of opposition (dated March 8, 1992) to geothermal development and underwater cable. Other issues discussed: use of alternatives (solar, wind and water), destruction of the rainforest and fracture of oil-encased underwater cable.

Letter from Eileen Fiorentino, April 14, 1992.

Concerned that there is no master plan for geothermal development and no adequate safety and evaluation methods. Mentions air quality, land use, water resources, geothermal hazards, and alternatives.

Letter from Randolph Ahuna, HIGA Co-Chairman (and member of the Kanoelehua Industrial Area Association, Inc., Hilo, Hawaii), April 15, 1992.

A geothermal supporter: mentions frequent blackouts and power surges, likes local control of energy. As a Native Hawaiian thinks geothermal, is a gift to be gathered.

Letter from Don Abdul, April 13, 1992.

Based on his research, believes geothermal is renewable, is cleaner and more available than oil, and will be good for the economy, jobs, the earth, and the earth's atmosphere.

Letter from Kevin E. O'Connell, April 13, 1992.

Project is in an environmentally fragile area unique to the Hawaiian Islands; it will be too close to residences and schools.

Letter from John E. Crawford, March 30, 1992.

Submits resume and qualifications (no scoping issues). He is interested in consulting on problem-solving and trouble shooting; would like short-term assignments, particularly in an advisory capacity on the HGP.

Letter from Jay A. Graven, Commander, Naval Base at Pearl Harbor, May 1, 1992.

The Navy is concerned about the submarine power transmission routes, any electrical interferences emanating or caused by the cables, and any effects to shipboard operations.

Clip-and-ship coupon from Anita Jackson postmarked May 4, 1992.

Suggests that consideration must be given to the alternatives to geothermal development.

Letter from Megan Simpson to Secretary of Energy, March 20, 1992.

Suggests that alternatives should be looked at. Warns of the problems of geothermal development which occurred at California plant. Problems included gross inaccuracies in predicting production, toxic gas releases, and H₂S health problems; need to look at alternatives; and the threat of power lines to health.

Letter from Jan L. Reichelderfer, December 1, 1992.

Geologist seeking a position with the EIS project; sent a resume (no scoping issues).

Letter from Max Goldberger, Hawaii County Economic Opportunity Council, March 12, 1992.

A supporter of geothermal in general; proposes a more balanced attention to other renewable energy projects, especially solar. Gives a brief overview of past solar research. Proposes that energy should not be shipped

to Maui or Oahu by cable, but rather via liquid hydrogen.

**Letter from Senator Richard Matsuura,
April 6, 1992.**

Copy of a letter to the editor of the Hawaii Tribune Herald. Basically explains why Senator Matsuura proposed an interim Legislative H₂S standard that would allow the geothermal developer to continue operations until a statewide standard is set without losing thousands of dollars a day.

**Letter from John P. Scheltens, Office of the
President, National Speleological Society,
December 30, 1991.**

The organization offers the expertise of the Hawaii chapter to conduct the necessary fieldwork for the speleological portion of the EA of the Wao Kele O Puna area of Hawaii County.

Letter from Dennis Sevilla, April 1, 1992.

Urges that PGV be allowed to complete their project in Puna. There is a need for alternatives since the sugar industry, which provides about 1/3 of the island's electricity generation via biomass, is under threat of going out of business.

Letter from Eric Hill, April 2, 1992.

Expresses concern over destruction of the rainforest and endangered species. Other issues expressed include: air quality, health effects, infeasibility of an undersea cable, and alternatives such as OTEC.

Letter from Mary Jo Bafle, March 30, 1992.

Puna resident opposed to geothermal. Issues voiced: having power plants in a

residential community, geothermal is not renewable, health, and the infeasibility of an adequate evacuation plan for Puna.

Postcard from Dave Gomes, no date.

Expresses the need for an alternative energy source in Hawaii and requests completion of the geothermal project in Puna, Hawaii.

Letter from Bonnie P. Bator, April 2, 1992.

Believes geothermal energy is not renewable and will take up a lot of land. There is a need for: a groundwater study, sampling of each well, a study of the cumulative H₂S effects on residents, and analysis of synergistic effects of the toxins.

**Letter from Aurora Martinovich,
April 10, 1992.**

Asks: What are the combined effect of toxins on children and the elderly?, Will reinjection contaminate the water table?, Who will monitor the release of toxins?, What are the effects of noise, conflict, and emotional and physical stress on residents?

**Letter from Frank A. McHale, Dillingham
Construction, April 6, 1992.**

The geothermal resource will reduce Hawaii's dependence on environmentally harmful energy sources to meet growing electricity demands. Oil/coal plants are a detriment to the environment, (e.g., potential spills during transportation). Additional issues expressed: air quality; the undersea cable is feasible.

Letter from Gary W. Barnett, V.P. & Manager, Puna Orchards, Inc., April 6, 1992

Orchard manager is concerned about: groundwater pollution and groundwater quality, falling property values, grid failure and subsequent uncontrolled venting, endangered plant and animal species, Native Hawaiian needs, and greed and corruption of state government.

Letter from Murray E. Towill, Dept. of Business, Economic Development and Tourism, April 2, 1992.

Corrects DOE's stand that Hawaii is planning a 500-MW plant; the plan currently calls for a smaller plant to satisfy only the Big Island's power needs.

Letter from Clayton H.W. Hee, Chair, Board of Trustees, State of Hawaii, Office of Hawaiian Affairs, April 8, 1992.

There is very real concern that we may be sacrificing too much of our natural environment, culture, and socioeconomic future for the vague promise of energy self-sufficiency.

Letter from George T. Iwahiro, Executive Director, HECO, April 8, 1992.

There is a basic need of the County for the contracted electricity (with PGV). Extensive comments on energy production, costs and financing. Believes the undersea cable is feasible.

Letter from Charles W. Toto, State of Hawaii, Dept. of Commerce and Consumer Affairs, Div. of Consumer Advocacy, April 10, 1992

The HGP study should give attention to geothermal costs relative to alternate ways to satisfy future energy service needs. Enclosed is a copy of the Public Utilities Commission's framework order in the IRP (Integrated Resource Planning) docket and a copy of a brief statement of their analysis methodology.

Letter from Allan Kawada, Hawaii Project Coordinator, True Geothermal Energy Co, March 16, 1992.

Lists several documents and court cases that can provide helpful background information for the EIS.

Written scoping testimony from Dr. Jim M. Anthony, March 14, 1992.

Voices displeasure with geothermal development in Hawaii. Other issues mentioned: destruction of the environment, energy consumption costs would not be lowered, health, Native Hawaiian issues and geologic hazards.

An unsigned scoping testimony, no date.

Environmental effects should be considered as global and not merely local. U.S. should reconsider "material standard of living," that necessitates huge power demands. The United States is a global role model (human rights—Native Hawaiian issues, environment-destroying the rain forest).

An unsigned scoping testimony, no date.

The testimony urges people to stop the destruction of the environment and the

lowland rain forest. Respect needs to be shown to Pele, the Goddess of Fire. Other issues mentioned: health effects from EMF.

Letter from BHP Petroleum, Pacific Resources, February 1992.

A paper that evaluates geothermal energy in light of Hawaii's dependence on imported crude oil: "Until Hawaii finds a way to achieve a significant reduction in petroleum-based transportation fuels for cars, buses, jets and ships—without negatively affecting our fragile economy—it is not realistic to anticipate a decrease in the number of imported barrels of crude oil."

Scoping testimony from Andrew C. Kier, September 26, 1991.

Presents an outline of topics and issues. Land use conflicts: problems with industrial development in a rural, farming community. Air quality: emissions from HGP-A have affected the health of the community and degraded property values. Water quality is at risk from well casing failure. Geothermal development induces seismic activity. Blowouts and uncontrolled venting kill animals. Alternatives should be researched.

Scoping testimony from George T. Iwahiro, V.P. of Engineering, Hawaiian Electric Co., September 26, 1991.

His company has expressed interest in buying geothermal power delivered to Oahu. Earnest negotiations cannot continue until the EIS is completed. Several projects and reports are mentioned that could aid the EIS process (Hawaii Deep Water Cable Project EA, Visual Impact Analysis of Proposed 300 kVDC Line, IRP docket by the Public Utilities Commission).

Scoping testimony from Scott Derrickson, Energy Affairs Advisor, Sierra Club of Hawaii, no date.

Hawaiian Home Lands should not be used for inter-island electricity transport. Animosity and distrust may impede the EIS. Questions the electricity rate impact of geothermal and the required backup generation system; How does geothermal affect the Public Utilities Commission's Integrated Resource Planning docket? Hawaii has many endangered species that need protection. Alternatives should be considered, especially energy efficiency.

Scoping testimony from Annie Szvetcz, Rainforest Action Network, no date.

Rain forests are integral to planetary health and need to be preserved. Ecological effects on Kilauea's forest needs to be examined. Suspicion of DLNR for trading the forest against profit motives. Three distinct rain forest components need to be studied: (1) impacts from direct clearing of vegetation for roads, power lines, exploratory and development wells, and power plants; (2) indirect impacts on the entire Kilauea East Rift Zone; and (3) impacts on the cultural resources of this forest ecosystem.

Scoping testimony from Robert Kai Irwin, no date.

Supports the no action alternative because Native Hawaiian culture will be severely affected by geothermal development and endangered species are highly threatened by the development of geothermal energy. Alternative sources should be thoroughly examined.

**Scoping testimony from Kelley Pomeroy,
March 16, 1992.**

Issues raised: (1) Need to take a look at energy consumption and try conservation instead of simply expecting the ratepayer to foot the bill for nonrenewable energy. (2) Study the costs to ratepayers and taxpayers of geothermal vs. renewable sources. (3) How will visual impacts of transmission lines be assessed? (4) Study the effects of transmission lines on animals and communications. (5) What will happen to residual oil if it is not used for electricity generation? (6) Increased power will only make the State more energy dependent.

Scoping testimony from Northwest Economic Associates, April 22, 1992 (date of press release).

Preliminary findings of a report studying geothermal development on Kilauea with cable concludes: (1) previous cost estimates of \$1 to \$1.9 billion are low and more realistic costs exceed \$4.0 billion; (2) the cost-benefit ratio of development is still less than one; and (3) ratepayers will pay \$1 to \$2 billion for electricity generation with geothermal compared to \$25 and \$35 per barrel of oil.

**Scoping testimony from June Curtiss,
Chairperson, Hawaii Island Geothermal Alliance, March 16, 1992.**

Modern control technology can make geothermal a clean, contributing, good neighbor. The organization supports alternative energy sources and concludes that geothermal development does not violate Native Hawaiian rights. Health impacts must be closely considered, realizing that other communities around the world live side-by-side with geothermal development.

**Letter from Paul P. Spaulding III, Sierra Club
Legal Defense Fund, April 15, 1992.***Policy Issues*

1. The HGP EIS should use the March 1990 Hawaii proposal to Congress instead of the 1989 proposal to Congress because the 1990 proposal is:
 - a. more specific about the proposed plans for Phase 3 development,
 - b. affirms the State's perspective on the scope of the project,
 - c. resulted in an appropriation of \$5 million for development, and
 - d. contains other [unidentified] information that the Sierra Club considers important to adequate evaluation of the project.
2. Programmatic and site-specific EISs for geothermal development are needed; a site-specific EIS is required because of the emphasis that has been placed on the three subzones and the identification of proposed drilling sites.
3. The State of Hawaii should be a "cooperating agency" rather than a "co-lead agency" in development of the EIS because of its role as a geothermal advocate.

No Action Alternative

1. The "No Action" alternative should specify that Phases 3 and 4 of the HGP do not occur at all, instead of not partially funding the HGP.
2. The "No Action Financing" alternative should consider partial financing by any one of the other 14 federal agencies enjoined by the Court decision from funding Phase 3 and Phase 4.
3. Alternatives should consider:
 - a. participation by State and private developers in the HGP,
 - b. the role of True/Mid-Pacific and PGV in Phase 3 development, and

- c. continuation of the University of Hawaii Scientific Observation Hole (SOH) program.

Ecological Resources

1. The EIS should consider individual threatened and endangered species.
2. Consider unique ecosystems such as the Wao Kele O Puna rain forest, which is the largest remaining example of a functioning, low-level tropical rain forest in the United States.
3. Ornithological studies should be conducted at the time of year when mating and calling occur (March-May) to be sure that as many species as possible are identified.

Cultural Resource Issues

1. Use local expertise for environmental and cultural issues (Smith provided a partial list of people who can provide expert information).
2. Address impacts on Hawaiian culture, religious practices, and on the social welfare of the community.

Letter from William D. Smith, April 13, 1992.

Comments focused on the judicial and administrative process surrounding HGP. The letter reviews and critiques the State of Hawaii's regulatory process; it argues that the EIS should review the history of geothermal development and that the regulatory stance of the State of Hawaii is required for an analysis of environmental impacts. He states that investment of money by DOE for geothermal development in Hawaii would continue the existing course of events already threatening human life and property. Mr. Smith provides background information, including laws, law suits, and references. His letter also includes a list of expert contacts.

Policy

1. Hold additional public meetings after the Notice of Intent to assure the public that their points were understood and considered in the scoping process.
2. Make a full disclosure of economic benefits to be realized by Martin Marietta as a result of geothermal development and demonstrate how individual researchers of Martin Marietta will be "insulated" from conflicts of interest.

Legal/Regulatory Issues

1. Note that underground injection control rules are inconsistent with federal laws.
2. Characterize the State's regulatory stance on geothermal energy.

Cumulative Impacts

1. Take a retrospective look at geothermal development because of the questionable practices of the State and private developers in the geothermal development in Hawaii.
2. Address past permitting for development under conditions that did not provide standards for emissions of H₂S.

Hazardous Wastes/Pollution

1. Address the adequacy of regulations for containment of hazardous wastes from drilling fluids and geothermal brines.
2. Consider drilling additives and sludge from H₂S abatement, which may contain heavy metals, as hazardous wastes.
3. Consider the disposal of air pollution control and abatement facility byproducts as potential hazardous wastes.
4. Consider the potential pollution from catastrophic disruption of 500 + MW geothermal wells, pipelines, and production fields.

Water Resources

1. Consider groundwater contamination and the State's contention that groundwater is not covered under the Clean Water Act because it is not among the navigable waters of the State.

Health and Safety

1. Consider venting, which can result in production of geothermal brine at a rate of 110,000 lb/hr and the potential for brines to contain contaminants that are harmful to human health, animals, and vegetation.
2. Consider blowout effects and effects of air emissions on human health (suggestions of several actions, including studies).
3. Consider the proximity of public water supplies to the proposed geothermal development (e.g., Kapoho community's public water supply — a well — was downgradient from True's site).

Project Description

1. Consider that 3–4 times the number of producing wells would have to be drilled to provide the required number of production wells to support the proposed development

Ecological Resources

1. Consider the loss of rainforest that would occur to support wells, roads, and waste disposal sites.
2. Consider the introduction of alien flora and fauna into the rainforest that would occur from project-related disturbance.
3. Smith states that the original forest growth would not be able to repopulate new lava flows and that the effect of destructive intrusion into Wao Kele O Puna for geothermal development would provide a "network of forest destruction

[that] would overwhelm original growth" ability to revegetate the areas disturbed either in the short- or long-term.

Submarine Cable

1. Consider the potential for failure of the undersea cable, including the adequacy of precautions to protect the cable in the long-term and back-up measures in the event of failure.
2. Address the feasibility of the cable and the ability to install the cable.

Alternatives

Mr. Smith does not provide specific proposals for alternative energy sources or alternatives to the proposed project.

1. Address the need for power.
2. Address the development of alternative power sources.
3. Economic and energy demand scenarios should include futures for Hawaii that lessen the dependence on tourism and diversify Hawaii's economy in directions other than suggested by recent Spaceport and seabed mining proposals; the relationship between geothermal energy development and potential industrial development should be assessed.
4. Because geothermal energy is not a renewable resource, its inclusion in the same list as biomass and solar is misleading.

Geology

1. Address seismicity and the potential catastrophic failure of a geothermal field.

Emergency Preparedness

1. Address emergency responses to a catastrophic disruption of 500 + MW geothermal well, pipeline, and production field.

Economics/Costs

1. Mr. Smith is particularly interested in the hidden costs of the proposed HGP, and wants them assessed in the EIS. Hidden costs include the following:
 - a. dismantling and removing the geothermal facilities,
 - b. revegetating and reforesting Wao Kele O Puna, and
 - c. civil unrest, litigation, and civil disobedience.
2. Assess the costs of H₂S abatement requirements.

Goddard and Goddard Submittals

The Goddard and Goddard submittals consist of a number of documents, or portions of documents, rather than comments on the proposed HGP per se. Although the documents raise issues that are relevant to the EIS, they may better be treated as references than as scoping comments.

- *Comments, Recommendations, and Technical Review of Puna Geothermal Ventures' Draft Air Toxics Impact (Hazards) Analysis and Updated Draft Emergency Response Plan*, particularly the cover letter from Wilson Goddard to Governor Waihee et al., dated Dec. 31, 1991 (see also the fourth and sixth bullet items below).

Air Quality

1. Discusses (a) H₂S; (b) total suspended particulate matter, "inhalable" particulate matter (PM-10), and air toxics generally; and (c) specific air toxics (other than H₂S), namely lead, arsenic, silica oxide, hydrogen chloride, and radon.
2. Discusses the need for an air toxics impact analysis of a blowout.

- *Review of Use Permit Conditions* (beginning on page 5 of the Goddard and Goddard packet under the cover letter of December 31, 1991)
- *Review and Response of the County of Hawaii, Geothermal Resource Permit* (beginning on page 8 of the Goddard and Goddard packet under cover letter of December 31, 1991)
- *Comments, Recommendations, and Technical Review of Puna Geothermal Ventures' Draft Air Toxics Impact (Hazards) Analysis and Updated Draft Emergency Response Plan*, under the cover letter from Goddard and Goddard Engineering to J. Mark Ingolia et al., dated December 13, 1991.

Item ES 1.0, Major Findings, raises the same issues that were raised in the December 31 cover letter discussed above. These comments are not directed specifically at the preparation of an EIS, but some of the comments are nonetheless relevant and will be considered in the preparation of the EIS, as noted in the discussion above.

Hazards Analysis

1. Discusses hazards analysis of H₂S, radon, and trace gases.
2. Discusses worst-case impact analysis.

Mitigation

1. Discusses mitigation/abatement/control with regard to the document cited above.

Health and Safety

1. Discusses health effects of H₂S.
- *Appendices A, B, C, and D* of the material under the Dec. 13 cover letter cited above.

- Draft, *Comments, Recommendations, and Technical Review of the Puna Geothermal Ventures' Air Toxics Impact (Hazards) Analysis and Updated Emergency Response Plan*, by Goddard & Goddard Engineering Environmental Studies, November 20, 1991.

Air Quality

The report reviews potential consequences resulting from accidental gaseous, particulate and/or aerosol air toxic pollutant releases at the Puna geothermal facilities. Estimates of worst case air toxics concentrations are included. Air dispersion modeling was performed for 12 upset scenarios to estimate maximum ambient H₂S concentrations.

Emergency Preparedness

The document criticizes the policies promulgated by agencies within the State of Hawaii and Hawaii County.

1. Discusses emergency response in the event of hazardous release and the need for preparation of an emergency response plan as a mitigation measure.

Monitoring

1. Suggests that there should be better monitoring for actual emissions and dry deposition from brine aerosols.
- Goddard & Goddard Engineering Environmental Studies, letter dated April 30, 1992

This letter lists 9 Hawaii geothermal samples that will be analyzed. As mentioned in the letter, analyses of the samples should prove useful in identifying potential toxics associated with the present Hawaii geothermal program.

Report by the Hawaii Department of Business and Economic Development and Tourism, *Hawaii Integrated Energy Policy*, December 1991.

This document summarizes Hawaii energy policy and concerns as of 1991. It is the product of a process which included 57 individuals from 34 participating agencies and organizations, plus hundreds of citizens who provided input during public review meetings. Considerable factual background material is included, covering energy use and supply. There is a 70-item bibliography of studies and reports relating to Hawaii energy policy. This document may better be treated as a reference than as a scoping comment. Nevertheless, a summary of the points relevant to the HGP EIS is provided below.

1. Energy objectives of the State of Hawaii are:
 - a. dependable, efficient and economical energy supply, Statewide and
 - b. increased energy self-sufficiency.
2. Strategies to pursue these objectives:
 - a. increased diversification of imported energy sources and
 - b. development of indigenous energy sources.
3. Public comments received from a series of public review meetings held throughout the State, where the draft Hawaii Integrated Energy Policy (HEP) report was presented included the following:
 - a. Commenters almost universally thought that energy conservation, as a resource, needed far more emphasis in Hawaii, in general, and in the report in particular.
 - b. Commenters were skeptical of the State's willingness or ability to implement or act on the recommendations in the report.
 - c. Most of the commenters from neighbor islands expressed their concerns about geothermal and the way the State has handled this

development, which they thought was an example of how **not** to proceed to develop renewable energy sources. Commenters thought that public input and due process were ignored.

- d. Many members of the public thought the lack of systems to monitor permit compliance adequately and to perform enforcement and regulatory duties as the weakest link in guaranteeing the safe development of energy resources.
- e. In nine pages of summarized public comments, no public support whatever can be discerned for either geothermal development or OTEC. There also was no support for an underwater cable to connect the electric systems of the different islands.
- f. The recommendations made in the HEP report for reducing the present 90% dependence on imported oil include a variety of measures to increase energy use efficiency, but stop short of recommending or endorsing the HGP. The existence of a geothermal resource is noted (along with wind, waves, OTEC, biomass, etc.), but its magnitude is estimated 100 MW or less. The HGP as such is not discussed.

Minutes of the Hawaii County Energy Advisory Commission (HCEAC) meeting

Minutes for the HCEAC were submitted during the time of scoping, but not as scoping comments. The minutes were reviewed for information relevant to the HGP EIS:

Meeting: Thursday, March 5, 1991, Komohana Agriculture Complex. This meeting of the EAC contained little relevant to scoping for the HGP EIS.

Meeting: January 8, 1992, UH Cooperative Extension Service Bldg., Hilo. The minutes of the meeting include three perspectives on geothermal development. One perspective

notes the perceived health effects attributed to present developments and questions the technical expertise of the developers. The second perspective presents the Electricity Committee's belief that additional power is needed on Hawaii and suggests short-term solutions; geothermal development is recommended for the long-term if health and safety requirements can be met. The third perspective suggested alternatives to reduce electric demand.

Perspective 1: A Pahoia Community Association member made the following points:

1. The geothermal plant is responsible for major health and safety problems so far. How will the government assure the well-being of residents of the Puna District?
2. The expertise and record of ORMAT Energy Systems, geothermal developers in the Puna District, was questioned. Documentation to support this point of view included evidence provided by the Far West Electric Energy Fund (FWEEF), which describes ORMAT operations in Steamboat Springs, Nevada. Such evidence indicates that ORMAT Energy Systems should be examined before being allowed to continue.

Perspective 2: The Electricity Committee of the Hawaii County Energy Advisory Commission (HCEAC) reported on the present electricity shortages on the Island of Hawaii. It recommended two actions for the short-term:

1. Institute a public education conservation program.
2. Use the generators of a U.S. Navy cargo ship to be anchored at Hilo or Kawaihae to provide the extra power necessary to cover HELCO's power deficiencies and prevent rolling blackouts.

The committee, after analyzing medium- and long-term electrical needs for electricity and a variety of sources, recommended that, for the medium-term, hydroelectric, ethanol, solar thermal, secondary heat recovery, and biomass be considered and, for the long-term, solar be examined. The committee was in favor of geothermal, provided that it was placed under very rigid standards, assuring that the health and safety of people came first. The committee believes that in order to avoid rolling blackouts, additional generation capacity will be required for the HELCO system.

Perspective 3: Various suggestions and recommendations were made by appropriate committees and individuals in regard to electric cars, monorail transportation, and ethanol fuel. The relevance to HGP is that a large fraction of all fossil fuel used on the Island of Hawaii is used for transportation.

The Warshauer Affidavit (affidavit of Frederick R. Warshauer in the Kaolelo Lambert John Ulaleo and the Pele Defense Fund vs Wm. Paty, Chair and members of the Board of Land and Natural Resources), no date.

The Warshauer affidavit discusses the Windward Kilauea Successional Ecosystem (WKSE) and provides a summary of the tectonic (earthquakes and volcanism) history of the Kilauea volcano and its associated "rift zones." Apparently, the affidavit addressed the potential development of the True geothermal facilities, not the HGP. While submitted during the scoping period for the HGP EIS, this document does not address the HGP per se.

Warshauer has a BS in zoology, an MS in zoology, plus 3.5 years toward a graduate degree in botany. He spent 15 yrs examining the vegetation of the islands of Hawaii. From 1975-1982 he worked on the Hawaii Forest Bird Survey. He has worked with Jim Jacobi

on the distribution and dispersal patterns of exotic plant species, distribution and patterns of damage from feral pigs, the status and distribution of an endangered plant, a new species of plant, etc. He also worked with John P. Lockwood, USGS, on his geologic hazards analysis and mapping of lava-flow distribution on Mauna Loa volcano. At the time of the affidavit, Warshauer was a staff planner with the Hawaii County Planning Department, Hilo, Hawaii.

Tectonic History

Key points are the following:

1. Kilauea is the most active volcano in the Hawaiian Island chain and quite probably the most active volcano on earth.
2. Kilauea is in its growth stage.
3. Recent Kilauea volcanic activity (initiated in 1955) continues episodically to this day.
4. Volcanic activity at Kilauea generally is accompanied by volcanic activity on the east rift of Kilauea, which passes through the Puna District of Hawaii.
5. Kilauea and rift zone volcanism are always accompanied by moderate-sized earthquakes but some earthquakes occur without volcanism.
6. Recent lava flows, cinder cones, and fissures are common-place along the east rift zone of Kilauea. These features are well documented by MacDonald, Stearns and their co-workers.

Ecological Resources

Issues raised include the following.

1. The Windward Kilauea Successional Ecosystem (WKSE) is found only on a portion of the wetter windward slopes of Kilauea. The patterns, compositions, constant change, and existence of the WKSE are a result of the dynamic nature of the Kilauea Volcano.

2. A mosaic of vegetation has developed in response to lava isolation and the recolonization of juvenile lava fields. The success of the recolonization is the result of the ecosystem leaving "multiple replicates of its successional components" and adaptation of the vegetation to harsh conditions. Loss of these multiple components can lead to a decrease in species diversity.
3. Changes from native vegetation to an artificial assemblage of foreign organisms is an irreversible process that results in a permanent loss of acreage and variety of the successional ecosystem. As a result, these native forests already have been mostly eliminated from the lower elevations of the successional ecosystem.
4. The larger remnant portions of the native-dominated forest in the lowlands are not connected successional to each other, and therefore are of limited value in sustaining the WKSE in these areas.
5. The ecology of primary succession in the WKSE favors the native and selects against the invading foreign species. The ecology of primary succession on volcanic surface is healthy and vigorous in its current conditions.
6. The middle east rift zone should be viewed in its ecologically dynamic context not as a static "good" or "poor" forest; it should be recognized as the last of its kind. The proposal for the development of five tracts of land by True exploration is a blueprint for forest fragmentation and weed invasion and for barriers to movement of native species as are the roads, pipelines, and powerline interconnections.
7. True will use the forest as a dilution zone under their permit for H₂S. Normal operations will expose forest organisms to H₂S in excess of exposures allowed for humans located farther away. Because there is no information on the sensitivity of the forest and associated organisms to

H₂S, there is a need to determine the effects on vegetation, animals, and birds.

Hydrogen Sulfide

1. The Best Available Control Technology is insufficient to control venting of geothermal stream in an upset condition. Standards for geothermal development are too lax and were created by developer and DOH only.

Assorted Impacts of Site Development

1. Impacts include excessively loud noise, hydrogen sulfide plumes, night lights, venting and spillage of geothermal brines, potential accumulations of deleterious chemicals in the soil, etc.

Blue Ocean Preservation Society, April 10, 1992

The President of the Blue Ocean Preservation Society, Mr. Carl Freedman, sent the Society's comments on the scope of the HGP EIS. These comments are summarized below.

1. The HGP has progressed far without any sort of effective regulation, without effective public participation, and without sufficient information. The EIS would serve an important public policy function if it merely corrected the large deficit of reliable information on the project.
2. The EIS should, above all, include an economic assessment of the HGP. The basic question should be: does this project fit into a least-cost resource mix for Hawaii's energy future?
3. As part of this economic assessment, the EIS should take into account the economic and other risks presented by the HGP, since the HGP involves generating and cable technologies that are not

commercially proven. The EIS should examine scenarios in which the HGP ends up being abandoned or fails financially. Also, various system costs and reliability impacts of the project in the context of the Hawaiian utility systems should be included, and the costs for all externalities should be accounted.

4. The economic viability of the HGP project, and all alternatives to the project should be assessed using an integrated resource planning (IRP) methodology. IRP approaches should be considered state-of-the-art for utility resource planning. The IRP collaborative now established in Hawaii can serve as a starting point.
5. The IRP assessment should take into account the particular resource planning concerns that arise in the Hawaiian context, such as island grids, DSM costs under Hawaiian conditions, high marginal avoided costs, and data problems and lack of existing DSM policies and programs.
6. To make such an IRP exercise useful, the EIS process will need to greatly improve the data situation on current end-use efficiencies and conservation options in Hawaii. Reliable data should be generated regarding the State's building stock, floor areas, occupancy type, age, equipment saturations and efficiencies, and energy use intensities.
7. The EIS should take into account that Hawaii's IRP efforts are at a very early stage, and that per the PUC's order, no plans will be completed by the utilities until March to August 1993.
8. The Blue Ocean Preservation Society has a library for use on health and medical impacts of H₂S, and geothermal ground water impacts, and toxicology.
9. Native Hawaiian cultural and religious concerns should be given at least as much weight as environmental concerns.

Testimony submitted by Clint Churchill, March 9, 1992

Summary of Comments (Note that consideration of the alternative proposed by Churchill is a policy issue, one that may involve consultation with the State and other cooperators.)

1. The EIS should consider an alternative cable route for the HGP. The proposed new route is:

Big Island → Lanai → Oahu
Maui (Lahaina) → Molokai

The commenter says that this alternative route has been discussed in the geothermal industry and would dissipate much of the controversy surrounding geothermal energy utilization on Maui.

2. Advantages of this proposal:
 - a. The route would involve no new overhead power lines on Maui, mitigating concerns of aesthetic impacts regarding the transmission system on Maui.
 - b. Lanai, Maui, and Molokai would receive geothermal electricity.
 - c. The Lanai-Maui-Molokai interconnection can be installed before the geothermal project is complete, which would benefit those islands in terms of air quality and lower electricity rates.
3. Geothermal energy would be an important part of the solution to meeting Hawaii's energy needs.
4. This alternative route needs further environmental review with respect to aesthetic and other impacts associated with cable landings on Lanai, Maui, and Molokai, as well as land use concerns on Lanai. The potential environmental impacts to Lanai would need to be given full environmental review.

**Letter from Donald Thomas, Geochemist,
University of Hawaii and Co-chair of the
Hawaii Geothermal Technical Advisory
Committee, U.S. DOE, April 10, 1992**

This 5-page letter contains comments on topics that the author believes must be addressed in the EIS for the HGP. The comments are summarized below.

1. When comparing the environmental impacts of proposed HGP with the most probable alternatives, expanded use of coal and oil for electricity production, it is essential to consider all impacts, not just those that occur simultaneously with the production of the electricity. Thus, for example, the site-specific impacts of producing oil from Alaska or Indonesia, or coal from Indonesia, should be included.
2. When considering the emission category of impacts, Dr. Thomas recommends comparing the probable alternatives (geothermal, coal, oil) by determining what it will cost to reduce emissions of each source to the level produced by the lowest emissions source, and doing the comparison separately for each pollutant.
3. The health effects of different air pollutants must be assessed for all alternatives.
4. The existing arrangements for generating electricity in Hawaii involve the transportation of residual fuel oil from refineries on Oahu to several of the other islands. Refined products (diesel fuel, gasoline, aviation fuel) also are transported. There exists considerable concern about the environmental consequences of possible large spills. Dr. Thomas points out that the environmental costs of possible oil spills in Hawaiian waters must be included in the EIS.
5. Coal and oil are not renewable resources; production of electricity is not the highest and best use possible for them. Further, there is no higher use for the geothermal

heat than making electricity, as proposed under HGP; if the heat is not used it will dissipate through natural processes and be lost.

6. Electrical load on Oahu is increasing steadily and existing power plants are nearing the end of their useful lives. Conservation measures, while desirable, are not a large enough source to meet the need. Many proposed conservation measures are expensive; only those that meet a reasonable cost-effectiveness standard should be considered. Projected demand on Oahu must reflect currently projected power requirements.
7. The HGP EIS must consider the views of the residents of Hawaii on their desire for geothermal energy. Dr. Thomas states that public opinion polls, both on the Big Island and Statewide, show that the public favors HGP by a large margin.
8. Dr. Thomas has a database of more than 1,000 titles relevant to HGP that he is willing to let the EIS preparation team use.

Letter from Denise Fleming, March 11, 1992

Stresses the sharp decline in the job market in Hawaii and points out that the geothermal project will open job opportunities as well as reduce the island's dependence on imported oil. Ms. Fleming states that real estate sales in the vicinity of PGV continue to be brisk even after the blowout. The threat and occurrence of blackouts stifles the Hawaiian economy. Attached is a copy of a letter on blackouts sent to the Hawaii Tribune-Herald.

Letter from John A. Broussard, March 16, 1992

Submits and supports the idea of mandating the installation of solar hot water heating for all new construction including residential, commercial and industrial. The

claims of this conservation effort are presented as are the rebuttals to criticisms of solar hot water heating.

Written testimony from Kalai Malin, no date

Provides a native Hawaiian's opinion that the people are not receiving any advantages for the production of power for Oahu.

Written testimony from Matthew K. Adolpho Jr., no date

Mr. Adolpho's basic statement is "Just leave Molokai alone."

Letter from Kilia Purdy, March 12, 1992

The letter is in Hawaiian and is now being translated and summarized.

Written testimony from Albert Ia-ea, March 11, 1992

Written in Hawaiian and translated into English. Disagrees with a policy that will raise his taxes for the benefit of others.

Written testimony from Malia, no date.

Geothermal "destroys the land, destroys the air, destroys the water. Respect grandma Pele, respect the Gods. Take care the land, love the land. No destroy the land."

Written testimony by Clement Reyes Jr., March 12, 1992

Written in Hawaiian and is now being translated and summarized.

Written testimony from Kaleoaloha English, March 11, 1992.

Written in Hawaiian and is now being translated and summarized.

Written testimony from Kekau, no date.

Written in Hawaiian and is now being translated and summarized.

Written testimony from Kamuela Hamakua, March 12, 1992

Written in Hawaiian and is now being translated and summarized.

Letter from Wally Bachman, Science Advisor, Citizens Advocating Responsible Education, March 14, 1992.

Brings up some geothermal development history and suggests that the developer put up a bond at least equal to the value of all homes and property in the area that might be condemned due to an irreparable well rupture. Also questions the rationale for locating the drill site so close to an active volcano. Makes a plea to protect all the people who live close to the proposed site.

Letter from Lyn S. Bonk, President, Molokai Cares, no date.

Opposition to any type of electrical production on the Island of Hawaii. Also opposed to transmission corridors and landfalls for the undersea cable on Molokai. The issue of the effects of an undersea cable on marine life was also raised.

Testimony from Sarah Sykes, no date.

Points to several reasons for not pursuing geothermal. Points out that it is important to learn and respect the beliefs of others. The EIS should address not only the physical but also the cultural environment.

Written testimony by Christiane Shafer, no date.

Maintains that solar power should be implemented instead of geothermal power.

Written testimony by Leana Dumag, no date.

Against the development of geothermal energy because it benefits only the developers. Cites the health effects reported from a leaking well and expresses concern over the destruction of the rain forest and the desecration of Pele.

Written testimony from Penny Rawlins-Martin, no date.

Concerned about the destruction of the rain forest and questions the need for more energy. Also questions the cost of the undersea cable and who ultimately pays for it.

Letter from Janie Bryan, no date.

Opposed to government intervention into a private development effort and the taxpayer costs associated with such an effort. Lists the following concerns: (1) violation of Native Hawaiian religious and land rights, (2) destruction of archaeological sites, (3) water pollution, (4) terrestrial and marine species extinction, (5) air pollution, (6) oil spills from an oil-lined cable, (7) noise pollution, (8) geologic hazards, and (9) social

and economic impacts. Alternatives to geothermal energy should be researched.

Letter from Pat Kikukawa, March 12, 1992.

Requests that all planning, construction, and production cease immediately on the geothermal project because (1) costs of development are high, (2) alternatives would cost less, (3) the Geysers in California have a disappointing history, and (4) geothermal development effects on the land and marine system would be harmful. Requests a copy of the completed EIS.

Written comments by Harry J. Olson, Principal Investigator, Geothermal Scientific Observation Hole Program, March 16, 1992.

States that Hawaii is approximately 90% dependent on petroleum and the State needs to develop alternative energy sources to rid itself of the dependency on foreign oil. Mentions geologic issues such as resource estimation and characterization. Believes studies need to be undertaken to assess the geothermal resource and a shallow hydrologic study to obtain data on groundwater depth, chemical composition, and possible reservoir leakage. The effect on air quality from current volcanic activity needs to be studied so that a reasonable comparison can be made between natural emissions and geothermal emissions.

Testimony from Dr. Sheila Laffey, ECO Productions, March 14, 1992.

Dr. Laffey, who co-produced the video "Geo-thermal: A Risky Business," relates her experiences while filming. The concerns she expresses are (1) locating the well site in proximity to an active volcano, (2) clearing a part of the rainforest, and (3) the polluting of underground water sources.

Written testimony by Terri Scott, no date.

Concerned about the use of geothermal energy to proliferate the production of nuclear arms through manganese nodule mining. The EIS should address the effects of HGP on: (1) the I'O or Hawaiian hawk, (2) the loss of species and habitat, (3) Native Hawaiian culture, (4) future residents of Hawaii, and (5) manganese nodule mining development and subsequent effects on the marine environment. Also mentioned are the issues of geothermal energy being a non-renewable resource and alternative energies.

Testimony from Rene Siracusa, no date.

Raises a number of questions: Will the EIS (1) address the Ormat and True projects? (2) address the logistics, feasibility and economics of off-grid private systems? (3) study tidal power, OTEC, and energy conservation? (4) estimate costs of damage to overland cable routes? (5) evaluate the effects of hydrogen sulfide on health? (6) study the blowout effects on bee populations? (7) note the lax restrictions of DLNR? (8) address the abrogation of the civil rights of the residents, (9) view the "Lewin Tape" that BIRAG has, and (10) discuss the "Geothermal Hidden Agenda" (What is the energy intended for)?

An Agricultural Tenancy Agreement, submitted with no date, no signature.

The agreement provides no names and refers to the property in question as identified on a Tax Map No. 1-4-01-10.

Lease Agreement, submitted by Puna Geothermal Venture, no date.

A copy of a lease agreement sent by the Bureau of Conveyances of the State of

Hawaii to Puna Geothermal Venture. The lease is between the Puna Sugar Company and Puna Geothermal Venture. The lease began on August 15, 1986, and continues for 15 years.

Scoping submittals from Rona Lee Kleiman, from March 30, 1992 to April 6, 1992.

Includes copies of letters the commenter has written regarding the severe health effects she has suffered as a result of geothermal development. Also included are several text files in support of Ms. Kleiman's arguments. In general, Ms. Kleiman feels her rights have been violated. The letters Ms. Kleiman has enclosed were ones sent to Governor Waihee (June 26, 1991), Lloyd Lewis (Sept. 16, 1991), Harry Kim (Feb. 12, 1992), Kenneth W. Carlson (March 30, 1992), *Star Tribune* (Apr. 16, 1991), and Sen. Daniel Akaka (July 9, 1991). All letters relate to the degradation of health Ms. Kleiman has suffered.

Packet from Robert Jacobson and Julie Hedgecock-Jacobson, April 10, 1992.

Looks at alternatives and lists questions that the Jacobsons feel need to be answered in the EIS: permitting, health and safety issues, volcanic effects, and the proximity of the Pahoia school to geothermal development.

Letter from Robert A. Hamburg, April 12, 1992.

Commenter has experience with and is a strong supporter of renewable energies. Suggests that any environmental study of the geothermal option in Hawaii must compare this option with the potential for intensive and extensive energy conservation options as well as the more appropriate use of low grade solar energy for things such as heating water.

It is unnecessary to exploit geothermal energy while gains can be achieved by conservation.

**Letter from Katherine H. Holford,
April 10, 1992.**

Believes that there has to be a better alternative to geothermal energy.

Letter from Thomas G. Kizis, Permit Coordinator, OESI Power Corp., to Connie Jennings, August 9, 1991 (submitted by Janice Wilson).

Enclosed with the letter is a chemical analysis (6/28/91) from a water sample taken from Ms. Jennings's catchment tank water system. Ormat claims the drinking water is safe. A written note on the letter indicates, however, that the recipients (Ms. Jennings included) do not have a catchment system, which they believe leaves doubts about Ormat's intentions.

NOAA Response Information Database, no date (submitted by Janice Wilson).

A listing for hydrogen sulfide from a hazards database. The listing provides information on the general description, NFPA Degrees of Hazard, physical properties, fire hazard, health hazards, fire fighting, non-fire response, protective clothing and first aid for exposure to hydrogen sulfide.

Letter from Janice Ola Wilson, postmarked April 11, 1992.

Contains material in addition to comments made at the March 7, 1992, Pahoa School meeting. Asks that studies be made on wells KS-1, KS-3, and KS-7 and that adequate monitoring of all wells be implemented. Asks several questions

regarding the health effects of geothermal development that she hopes are answered in the HGP EIS.

**Letter from Suzanne Ely Byrne,
April 9, 1992.**

States that federal funds should not be spent on the development of geothermally produced electricity on the island of Hawaii because (1) wells in this zone are vulnerable to earthquakes, (2) blowouts and drownings can be equated to destroying air and water quality, (3) the health of the people living in Puna would be affected, and (4) blowouts would prohibit evacuations.

Testimony from A'o Pohaku Rodenhurst regarding public comment for EIS on HGP (postmarked April 9, 1992).

Gives a brief history of the formation of the island archipelago, told from a native's perspective. Closes with "we the citizens of KaLahui Hawaii strongly and adamantly oppose any and all proposals of any geothermal plans for O'ahu, Maui, Molokai, and Hawaii...."

Fax sent by James A. Roberts, Ph.D., Partner, Principal Environmental Planner, Global Environmental, April 14, 1992.

Comments on the scope of the proposed analysis and documentation, and expresses interest in being of professional assistance on the project. Concerns expressed are: alternatives (particularly conservation), cumulative impacts, and growth issues in relation to adding that amount of electrical capacity. The remainder of the letter is a request for consideration for contract involvement. Enclosed is a Qualifications Statement and the Resumes of James A.

Roberts, Michael Melanson, and Steve Peterson.

Letter and submittals (newspaper articles and a chart titled "Some Commonly-Used 'Hawaiian' Medicinal Plants") from Dan Makuakane, Native Hawaiian elder and practitioner of native medicines, postmarked April 9, 1992.

Enclosed are letters Mr. Makuakane submitted to the *Hawaii Tribune-Herald*. Most of the letters are rebuttals and arguments to ongoing discussions. In general, Mr. Makuakane refutes many of the claims Native Hawaiians use for not permitting HGP to be built and is a firm supporter for the development of geothermal energy.

Newspaper article: "Kim Can't Soothe Puna Residents Angry Over Geothermal" by Gordon Y. K. Pang, *Hawaii Tribune-Herald*, March 13, 1992.

Describes a meeting at which Harry Kim (County of Hawaii Civil Defense Administrator) and Mark Ingoglia (Hawaii Department of health) addressed residents of lower Puna concerning the Puna Geothermal Venture's emergency response plan. The article states that Kim assured the crowd that "the PGV project will not be a health hazard for residents." Kim is also reported to have said that "nuisance levels coupled with elevated noise levels during a blowout would be cause for an evacuation.

Letter: an unsigned letter (with several attachments) to Governor John Waihee, State of Hawaii, March 19, 1992.

The cover letter asks the Governor to "read and contemplate" the attached materials. The first attachment, "Air Pollution Regulation," discusses how air pollution is regulated under the federal Clean

Air Act and describes how the first Hawaii DOH geothermal permit (issued to True Geothermal) used 100 ppb as the ambient air quality standard for H₂S, and how subsequent permits have used different levels. The document discusses the case of *Aluli v. Lewin* and asserts that ambient air quality levels must be set as a public policy based on public health and nuisance considerations (the material suggests that the DOH standards for True and subsequent developments were based on technological considerations).

The second attachment is a printed copy of the "Opinion Of The Court" (by J. Wakatsuki) in *Supreme Court of Hawaii: Noa Emmett Aluli, M.D.; Karl Kirkendall; Michael Laplante; Robert Petricci; Steven M. Moser, M.D.; Pele Defense Fund, A Hawaii non-profit corporation, Plaintiffs-Appellants, v. John C. Lewin, M.D., in his capacity as Director of Health, True Geothermal Energy Company, a Wyoming general partnership registered to do business in Hawaii, Defendants-Appellees*. No. 14815. Appeal from the Third Circuit Court (Civ. No. 89-358), March 18, 1992.

The third attachment is *Before the Department of Health, State of Hawai'i. In re Petition for Rulemaking: Proposed State of Hawai'i Ambient Air Quality Standards for Hydrogen Sulfide (H₂S)*. Steven M. Moser, M.D., Noa Emmett Aluli, M.D., and Pele Defense Fund, a Hawaii non-profit corporation, Petitioners.

The fourth attachment is a letter (from Steven M. Moser, to the Environmental Management Division, Clean Air Branch, Department of Health, which asks for clarification and confirmation of the procedures for public participation in a Department of Health Rulemaking.

The fifth attachment is a transcript *Supreme Court of Hawaii: Noa Emmett Aluli, M.D.; Karl Kirkendall; Michael Laplante; Robert Petricci; Steven M. Moser, M.D.; Pele Defense Fund, A Hawaii non-profit corporation, Plaintiffs-Appellants, vs. John C. Lewin, M.D., in his capacity as Director of Health, True Geothermal Energy Company, a*

Wyoming general partnership registered to do business in the State of Hawaii, Defendants-Appellees. No 14815, Civil No. 89-358, Appeal From The Findings Of Fact, Conclusions Of Law and Judgement Entered On May 9, 1990. Third Circuit Court. Hon. Shunichi Kimura, Judge.

Summary of mining leases and Assignment of Lease from Thermal Power Co., California, and Dillingham Corp., Hawaii, to Puna Geothermal Venture, Hawaii, submitted by the Kapoho Community Association, March 7, 1992.

Provides names of the lease holder, acreage leased, and general location of leased property. Some properties identified by tax map key. Lease assignment to PGV.

"Geothermal in Hawaii: A Mistake We Cannot Afford," pamphlet by Big Island Rainforest Action, submitted by Russell Ruderman, March 7, 1992.

Expounds the Big Island Rainforest Action Group's opposition to geothermal development in Hawaii. It argues that geothermal development of an active volcano is financially risky and creates serious health hazards. It cites the PGV blowout and problems with geothermal development in Iceland and Guatemala as evidence, and argues that geothermal development in Hawaii is more risky because of its proximity to residential areas.

The pamphlet also says that trading of Native Hawaiian lands (particularly rainforest lands) for geothermal development and "violation of Pele" are desecrations of Native Hawaiian religion, traditions, and cultural heritage. It also argues that the Wao Kele O Puna deserves designation as a Natural Area Reserve, as was the case before the land exchange. The immediate consumption of 1500-2000 acres and secondary effects (i.e.,

foreign species introduction, constant noise, and gas releases) will endanger the entire rainforest, which is naturally seeded by sensitive, native bird populations.

Lastly, the article argues for investments in energy efficiency and renewable resources—such as solar, wind, biomass, and OTEC—rather than geothermal development and suggests that supplies of residual oil will continue to be adequately available.

Letter from Russell E. Ruderman, March 7, 1992

Asks that the following issues be addressed: (1) long-term costs of geothermal development to rate payers including consideration of expanded well fields, loss of property values, lawsuits, damages and injuries, catastrophic failure; (2) costs of geothermal development relative to energy efficiency/conservation programs; (3) potential for induced seismic activity; (4) unlikelihood for oil dependence to be reduced by development of geothermal resource; (5) past permitting history and effect of geothermal lobbyists involvement in permitting process; and (6) abuse of civil rights because of misinformation provided to citizens.

Letter and attachment from Sierra Club, Hawai'i Chapter, signed by Nelson Ho, Chair of Conservation Committee, March 7, 1992

Submits the following issues for consideration in the EIS: (1) overland transmission routes be identified and discussed; (2) if 600 MW are generated so that 500 MW can be transmitted, impacts of 600 MW of generating capacity should be discussed; (3) PGV's June 12, 1991, blowout, scaled to the proposed project, should be used as a "worst case" accident scenario for consideration of social, economic, and environmental impacts; (4) extrapolate information from PGV's map of "worst case"

impacted areas during pollution incidents; (5) impacts of complete and partial loss of power to the power grid and other energy production facilities should be discussed; (6) effect on project economics of declining field pressure; (7) economic effects of pursuing energy development (geothermal) and conservation measures concurrently.

Attachment: Newspaper article: "Energy Efficiency Expert Brings Message Here," *Hawaii Tribune-Herald*, November 12, 1989. Discusses Amory Lovins, founder of the Rocky Mountain Institute and energy conservation expert, and energy savings possible by instituting conservation measures.

**Testimony from Greenpeace Hawaii,
March 7, 1992.**

Feels the following issues should be considered in the EIS: (1) impacts to marine species resulting from electromagnetic fields; (2) cable reliability and impacts of cable failure; (3) economic impacts, particularly to rate payers, from insurance costs of plants in Hazard Zones 1 and 2; (4) quantification of the geothermal resource; (5) definitions of development parameters, including locational restrictions and ratio of power plants to wellheads; (6) health impacts and impacts to ecosystems along transmission corridors; (7) cost analysis of all alternatives; (8) impacts of nighttime lighting particularly to endangered Newell's Shearwater; (9) potential for blow-outs; and (9) analysis of industrial development that will result from geothermal development (e.g., ocean mining industry). Also requests that Hawaii develop a master plan for geothermal development.

**Written comments from Alice Suncloud,
March 7, 1992.**

Questions the relationship between federal funding and private geothermal development in Hawaii, what liability the

federal government has for the activities of private developers, and whether existing permits will be reconsidered in light of the results of the EIS. Ms. Suncloud questions whether there will be any limit to the acres developed and asks for evidence of successful native forest revegetation. She further would like to know the costs of revegetation and the circumstances under which it occurred, (e.g., amount of deforestation prior to revegetation, and soil types). Ms. Suncloud asks if federal hazardous waste laws will apply to geothermal development activities. Lastly, she states that the social impact of geothermal development is greater than all other potential impacts, cites numerous incidents of social unrest in response to existing development, and suggests that social impacts are unmitigable.

**Letters and attachments from Carlyle
Meierdiercks to DOE, March 7, 1992.**

States support for geothermal development and asserts that the power is needed and past problems with odor have been resolved. Objects to the means being used by anti-geothermal groups and refers to a February 1992 IEEE article when arguing that there is a hidden agenda—and not rainforest protection—that is spurring on anti-geothermal groups. Attached is a copy of a letter from Richard Matsuura, State Senator printed in the *Tribune-Herald* (August 21, 1989) about alternative energy sources. In a summary letter, Mr. Meierdiercks again states his support and that of two colleagues for the geothermal project.

In an attached letter, Senator Matsuura expresses his opinion that geothermal energy is the "best option" for Hawaii, because it is a proven technology and is environmentally more acceptable than nuclear, coal or diesel.

The second attachment is a January 22, 1992, letter from Mr. Meierdiercks to the program manager of Hawaii PBS asserting that the portion of a McNeil Lehrer News Hour broadcast in which PGV presented the

benefits of geothermal development was intentionally interrupted.

Letter from Puna Community Council, Ed Clark, President, and Don Jacobs, Past President, to Yukio Naito, Chairman, Public Utilities Commission, Honolulu, Hawaii, March 7, 1992.

States that HELCO's grid system is unreliable and fragile and that a failure in the grid would result in venting of geothermal contaminants if a geothermal plant were connected. It cites a January 31, 1992, island-wide failure of the grid system that caused an island-wide blackout and states that the health, safety, and welfare of people within 10 miles of PGV's plant would have been at risk if the plant were online.

Written comments from Jim Snyder, March 7, 1992.

Expresses alarm about the PGV reopening because of its potential for pollution and because it suggests that True geothermal may also reopen. He believes the reopening occurred improperly, without the approval of the civil defense chief and before conditions for reopening had been met. He refers to a resolution to protect Wao Kele O Puna from economic development that was signed by 130 people at the 1991 Hawaiian Ecology and Evolution conference.

Written comments from Robert Jacobson and Julie Hedgecock-Jacobson, March 7, 1992.

Asks that the following issues be characterized or examined in the EIS: (1) emissions from resource and injection wells and clean-up procedures for the emissions; (2) environmental damage from existing geothermal development; (3) the need for the project to be located in close proximity to residential areas;

(4) responsibility for total project costs, including facility closure; (5) water use during normal operations and accident situations; (6) ongoing federal monitoring (environmental and health) and federal closure authority; and (7) possible damage (e.g., roofing deterioration) to private property from normal operations.

Written comments from F. Ann Ernst, March 7, 1992.

Opposed to any geothermal development near a residential area. Expresses concern for her and her family's health and describes symptoms they experienced during a controlled venting. Also expresses concern that the one road from Pahoa is an inadequate evacuation route.

Written comments from Francois L'Orange, March 7, 1992.

Cites NEPA and asserts that it has been violated, given "the present state and history of HGP, Ormat, OESI, and the True Geothermal Project in the Puna Forest Reserve and the proposed steps 3 and 4 of" HGP. States that DOE seed money and "potential profits" are reasons geothermal development "seems assured." Expresses concern that air and water quality, noise pollution, human health, and terrestrial effects are being ignored. The right to due process and public involvement have been denied, and property values have declined.

Written comments from Roy Mushrush, president of Kona Palisade Estate Community Association, March 7, 1992.

Reviews the energy production capacity and research related to ethanol and certain biomass fuels as alternatives to geothermal energy. Also expresses concern that reinjected

effluents will contaminate groundwater and questions why no plan exists to remove pollutants from the effluent.

Video - "No on Geothermal - The People's Decision," Pan Productions, Maui Hawaii, 1990, from Mary Groode

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.

Video - "Pele's Appeal," "Bulldozers in Paradise," "Geothermal: A Risky Business," and "Heated Issue."

Identifies 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; documents opposition to geothermal development with footage of protest rallies and pickets.

Video - MacNeil-Lehrer news hour report on HGP, broadcast January 14, 1992 on PBS.

Provides a general introduction to geothermal development in Hawaii; focuses on potential seismic effects and impacts to the rain forest; presents arguments for and against geothermal development.

Report: *Comments, Recommendations, and Technical Review of the Puna Geothermal Venture's Air Toxics Impact (Hazards) Analysis and Updated Emergency Response Plan,* submitted by Rene Siracusa.

[See Goddard & Goddard submittals.]

Report: *An Economic Analysis of the Kilauea Geothermal Development and Inter-Island Cable Project* by Northwest Economic Associates (NEA), Vancouver, Washington, submitted by NEA.

This report develops low and high cost estimates for the project. This is an updated report (1987 first ed.) that reaches the same conclusion as the earlier report: A large scale (500-MW) geothermal development on the Big Island of Hawaii and the inter-island power cable is not economically feasible.

Pele Defense Fund advertisement, "Geothermal on the Big Island: Ugly, Toxic, Costly, and Sacreligious," no date.

Opposes geothermal development and requests that the attached coupons be mailed and donations sent to their organization.

Written submission, "Relating to Geothermal Relocation of Residences, Testimony for Senate Committee on Science, Technology and Economic Development, February 10, 1992" from Aurora Martinovich.

Expresses concern over: a) continued community support by taxpayers for such a risky business, b) relocation laws, c) criteria for relocation program must be broadened and clarified, and d) current drilling must be suspended until the community is temporarily or permanently evacuated.

Letter from Goddard and Goddard, to Murray E. Towill, DBED, November 21, 1991.

Written in regard to Gerald Lesperance's request for comments on the October 1991 Geothermal Management Plan. The Plan is supposed to ensure the well being, health and safety of the Kapoho Community, especially

those in proximity to the PGV geothermal well field and power plant complex.

Press Release, Puna Community Geothermal Site Inspection Tour, December 3-8, 1990.

The press release describes the State-sponsored geothermal site inspection tour to California and Nevada by DBED personnel and community members Delan Perry, Luana Jones, Carl Kirkendall, Jane Hedtke and Debbie Pommerenk.

Puna Geothermal Venture, "Map of Residences Within 3500' of Production Well KS-3," by J. Sternfield, December 5, 1990.

Locator map indicates the footprint of residences within 3500' of the well.

Letter from Dr. John Lewin, DOH, to Maurice Richard, PGV, January 13, 1992, "Modification to Authority to Construct 25-MW Power Plant".

Dr. Lewin has sent modified special conditions that supersede the corresponding special conditions of Attachment II issued with ATC No. A-834-796 dated February 6, 1990 and as modified on March 16, 1991. The eight special conditions relate to procedures that can or cannot be followed by PGV.

Letter from Dr. John Lewin, DOH, to Maurice Richard, PGV, Jan 13, 1992, "Modification to Authority to Construct 14 Geothermal Exploratory/Development Wells."

Same as above but concerns 16 special conditions related to procedures that can or cannot be followed by PGV.

Letter from Gary McMurtry, University of Hawaii at Manoa, to Mr. and Mrs. Greg Pommerenk, February 25, 1991.

Indicates that experts find oil-field pipe contaminated by radiation.

Newspaper article from the *Anchorage Daily News*, June 9, 1991 (Source: Ed Clark).

Describes an oil-field pipe that was found to be contaminated by radiation. Source of the contamination could not be determined.

"Geothermal System Failures: Implications for Ground-water Monitoring," F. L. Miller, *Groundwater Monitoring Review*, Spring 1982, vol. 12, no. 2 (Source: Ed Clark).

Describes failures and suggestions for adequate monitoring of groundwater in the immediate vicinity of a geothermal plant.

News release reporting that Governor Waihee and Mayor Inouye on lifting the PGV drilling suspension, February 28, 1992 (Source: Ed Clark).

Announced that PGV has met health, safety and drilling criteria imposed by a joint State-County Geothermal Management Task Force. PGV is required to meet lowered levels of hydrogen sulfide and noise. Emergency Response Plan was approved, and locations where plan is available are listed.

Health Survey Summary from BIRAG and Pahoia Emporium Questionnaires for KS-8 Blowout of 6/12/91 (Source: Ed Clark).

Listing of responses to a BIRAG survey; it lists 44 different symptoms names by residents of 17 different subdivisions.

"A slowdown of geothermal? Not where DBED is concerned," copy of *Environment Hawaii*, a monthly newsletter (Source: Ed Clark).

The article raises the question of whether or not DBED is acting ethically in "pushing" the development of geothermal energy on the Big Island.

Letter from Senator Levin to Dr. Bruce Anderson, DOH, March 2, 1992.

The letter is in regard to drilling reauthorization, and urges DOH to call a meeting of the Puna Advisory Committee to start the process of understanding the monitoring procedures.

Letter from Senator Levin to Dr. Bruce Anderson, DOH, March 2, 1992.

The letter is in regard to a telephone response to 3/2/92 letter concerning the Puna Advisory Committee urging Dr. Anderson to convene a meeting as quickly as possible.

Letter from the County Planning Department to Luana Jones, February 6, 1992 (se.

Response to inquiry dated January 14, 1992. Cover letter from Sen. Levin to Governor Waihee asking when funds will be spent for air quality compliance officers.

Letter from Jay Hanson to the editor, "Associating Radioactivity with Many Geothermal and Volcanic Fluids," April 13, 1991 (Source: Ed Clark).

Expresses concern about levels of radon. Raises possibility that dried mud pits with high levels of heavy metals and radon might result from development of HGP and expose workers.

Letter from Senator Levin to Dr. John Lewin, DOH, November 22, 1991 (Source: Ed Clark.)

The letter refers to a situation similar to the one in Puna, Hawaii that occurred in Lake County, California (with respect to public concerns regarding geothermal wells). Only after establishing credible local permitting, monitoring, and enforcement programs and developing a steering committee with wide representation did the public concerns reduce.

Letter from Dan Williamson of HECO to Andrew Levin, dated November 22, 1991: cover letter from Andrew Levin to Maurice Kaya, Energy Division of DBED, dated December 4, 1991 (Source: Ed Clark).

The letter from Dan Williamson discusses HECO plans for meeting future demands for electricity in Hawaii. He states that geothermal energy will not have a major impact on power supplies on Oahu in the 1990's.

Fax from Jim Knoy, DOH, to Jim Albertini, no date (Source: Ed Clark).

Mr. Knoy has included a letter dated October 9, 1991 from Maurice A. Richard, PGV, to Dr. John Lewin, DOH. That letter is in regard to a response to issues raised by geothermal constituents about the June 12, 1991 incident at the KS-8 well.

Letter from Senator Daniel Akaka to Ed Clark, July 26, 1990.

The letter is in regard to receiving a response to a postcard regarding the development of geothermal energy.

Letter from Dr. Bruce Anderson, DOH, to Ed Clark, November 1, 1989.

Contains Department of Health's responses to the 21 comments provided by the public during the June 1989 informational meetings on the Puna Geothermal Venture's proposed project. Clarified DOH responsibilities. The State promises to redraft air quality rules and conduct formal public hearings in each county.

Letter from Mark Dellinger, County of Lake California, to William Kikuchi, Representative to Senator Inouye, February 27, 1990.

Mr. Dellinger is providing upon request some thoughts to consider for the development of Hawaii's geothermal resources based on his experience with the Geysers project.

Planning Commission County of Hawaii: Rule 12, adopted January 12, 1988 (Source: Ed Clark).

Rule 12 indicates that an application for a geothermal resource permit must include: pre-exploration meteorological, ambient air quality and noise level measurements that demonstrate the potential effects on surrounding properties through air quality and noise impact analysis; the measures proposed to be taken for protection of air quality by prevention and/or control of air emissions; and plans for monitoring air quality during each proposed phase of the project. **SB 2225 relating to Geothermal Royalties, Testimony for Senate Committee on Science, Technology and Economic Development February 10, 1992 by Ed Clark, President Puna Community Council.**

Mr. Clark agrees with the bill, SB 2225, and believes there should be no waiver

provided to developers for royalty payments. Attached is a page from the Hawaii Revised Statutes with the heading Conservation and Resources.

SB 2215 relating to Geothermal Resources, Testimony for Senate Committee on Science, Technology and Economic Development February 10, 1992 by Ed Clark, President Puna Community Council.

Mr. Clark does not believe the bill to be adequate citing developers willingness to pay small fines rather than investing in safety. Proposed amendments include significantly raising the fines for violations.

"Adverse Health Effects of Geothermal Emissions in the Kilauea East Rift Zone based on Goddard and Goddard Element III Part II" (Source: Ed Clark).

Reviews some exposure limits, actual exposures from KS-8 blowout and contaminants were not monitored.

Letter to J. Mark Ingoglia, Manager, Hazard Evaluation & Emergency Response Office, October 28, 1991 (Source: Rene Siracusa/Ed Clark).

The unsigned letter is in regard to PGV's dumping of carcinogenic and hazardous waste by PGV on their well site. The letter says the event was filmed by an Ormat employee.

Letter from Gerald Lesperance, DBED, to Delan Perry, July 10, 1989 (Source: Ed Clark).

Mr. Lesperance has attached a copy of HECO's "Solicitation of Interest" letter, a list of people who it was mailed to, and a list of

people who, on June 5, were still interested in the geothermal/cable RFP.

Letter from State Senator Andrew Levin to Jennifer Perry (Source: Al Simone).

Says University of Hawaii responded to his inquiry about an epidemiology study. Letter to Levin from A.J. Simone, President, University of Hawaii (attached) says the university has the expertise to do such a study, and there already is a memorandum of understanding to facilitate such matters.

Letter from Senator Rich Reed to Dr. Anderson, DOH, October 3, 1991.

Discusses health complaints of people living near geothermal operations. Suggests people are being told geothermal is clean, but people complain of health problems directly related to hydrogen sulfide. Questions why state has not done an epidemiological study.

Memorandum from K.L. Leslie, Toxicologist, HEER office, to Deputy Director of Environmental Health, October 10, 1991.

Contains a brief review of hydrogen sulfide toxicity and proposed action levels. Provides background information, and suggests reviewing what National Academy has done for hydrogen sulfide in terms of action levels.

Excerpts from State of Hawaii's EIS (1978) for Geothermal Research and Demonstration Facility Utilizing the HGP-A Well at Puna Hawaii.

Discussion of the dangers of a blowout, and sulfur sludge disposal.

Emergency Plan, Scientific Observation Hole Program, Hawaii Natural Energy Institute, University of Hawaii, September 1989.

Emergency Plan for geothermal exploration drilling activities within the Kilauea middle east rift zone as submitted by True/Mid Pacific Geothermal Venture.

Emergency Plan.

Provides Emergency Plan for Pahoa School.

Letter from Jennifer Perry to William Paty, Chairman Department of Land and Natural Resources, dated March 13, 1992.

Information request for results of a safety inspection, copies of drilling reports and monitoring of test results for an injection well, and a copy of the permit for that well.

Letter from William Paty, DLNR, to Jennifer Perry and Jane Hedtke, October 9, 1991.

Requests assurance of Department's continuing interest in casing and wellhead assembly inspections and analysis.

Geothermal Noise Level Guidelines, County of Hawaii Planning Department, May 7, 1981 (Source: Co. of Hawaii Planning Dept.).

Describes other noise level standards and their applicability to specific use at geothermal developments.

Letter from Jennifer Perry to William Paty, DLNR, September 24, 1991.

Questions the adequacy of the casing program and wellhead assemblies for the PGV project site. Cites examples of casing failures.

"Evaluation of and Recommendations for the Potential Acoustic Impact from the University of Hawaii Scientific Observation Hole Program," letter from Darby and Assoc. to M. A. Seki, University of Hawaii, June 8, 1990.

A copy of Drill Rig Noise Survey Results of the Rig at Sulfur Springs. The summary includes results of the survey and recommendations for additional noise suppression.

Memorandum from Governor Ariyoshi to Hideto Kono, Director of Planning and Economic Development, April 12, 1978.

Governor Ariyoshi, based on the recommendation of the Office of Environmental Quality Control, accepts the subject document as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes, and the Executive Order of August 23, 1971. The subject document is the Environmental Impact Statement for Hawaii Geothermal Research Station Utilizing the HGP-A Well at Puna, Island of Hawaii.

Response from the HGP-A Development Group to the County of Hawaii Planning Department Regarding Issues Relating to Special Permit No. 392, May 13, 1982.

Responds to complaints/concerns including communications, steam plumes, air/noise monitoring and includes a complaint

log, hydrogen sulfide chart reduction, and noise levels.

Noise Monitoring Plan: Scientific Observation Hole Program Geothermal Resource Permit: GRP 89-1, September, 1989.

Describes measures for mitigation effects of noise and minimizing noise complaints.

Volcanism and Mercury in Uluhe, February 1981.

Provides limited data on mercury released from volcanic activity of Kilauea and Mauna Ulu from February 1969 - February 1981. There is no indication of the units of measurement for the quantities of mercury in the soil or plants.

Memorandum from H. Stuart Kearns, Jr., Department of Research and Development, to Megumi Kon, County of Hawaii, May 5, 1992.

Discusses capital improvements to HGP-A well (hood and stack for muffler box), and operation environmental monitoring.

Letter from Donald Thomas, University of Hawaii, to the editor of an unnamed newspaper, dated December 2, 1991.

Discusses the use of geothermal energy in Iceland, including the apparent absence of adverse effects from human exposure to low concentrations of hydrogen sulfide.

Letter from Darby & Associates to Ms. Laura Glenn, January 29, 1991.

Contains summary of noise monitoring efforts performed from 10/1/90 to 12/30/90,

mostly for Scientific Observation Holes. Monitoring was done at three locations for 155 days, and many problems were experienced with equipment. Evaluates specific noise complaints.

"Noise and Wind Speed data at SOH-2," letter from H. J. Olson, Univ. of Hawaii, to Jennifer Perry, Kapoha Community Association.

Copy of noise and wind speed data for SOH 2 as collected by consultant, Alpha Microsystems, for the month of April 1991.

Chemical Quality of Ground Water in Hawaii by L. A. Swain.

Consists of a reference document for water quality in the State of Hawaii. This is Report R48 prepared by USGS (May 1973).

Water Quality Assessment of Geothermal Development in Hawaii, July 1982.

Consists of a thorough summary of water quality in areas adjacent to geothermal development that was prepared by the State of Hawaii Department of Health, Environmental Permits Branch, Wastewater Permits Section.

Ground Water Index - Hawaii Code 8 .

Contains a complete list of wells drilled in Hawaii from approximately 1922 to 1983. Most of the wells were drilled by farmers.

Groundwater Strategies for State Action, 1987.

Consists of an Environmental Law Institute Publication that contains Chapter

111 State Policies and Management Strategies 1987.

Chapter 30 Region 27, Hawaiian Islands.

Consists of a chapter from the Geological Society of America describing groundwater and geologic characteristics of the Islands that affect groundwater quality.

Uses and Abuses of Wastewater Injection Wells in Hawaii, no date.

Consists of a one-page, incomplete abstract on the uses and abuses of wastewater injection wells in Hawaii.

Letter from DLNR to Farm Bureau Members, December 7, 1988.

Informs farmers of the requirement to register wells and stream diversion works and declare water use, (to complete forms for Registration of Wells and Stream Diversion Works, and Declaration of Water Use).

"Groundwater protection program killing some development projects," article in the Star-Bulletin and Advertiser, no date .

Describes the State Department of Health's attempts to define a groundwater protection strategy.

Unsigned Testimony, no date.

Consists of a one-page testimony on the application by the RCUH and NELH for Scientific Observation Holes in Puna, GRP 89-1.

**Vegetation Assessment Reports; SOH #4
Puna, Hawaii, Char & Associates, 4471 Puu
Panini Ave., Honolulu, Hawaii 96816.**

Presents a summary of a vegetation survey of SOH #4 that was conducted in September, 1989. The report provides an inventory of species occurring in the overstory, shrub layer, and ground cover. The survey found no listed threatened or endangered species on the site. The report does not provide any information on the vegetation structure or species distribution on the site.

**Preliminary Faunal Survey of Proposed SOH
4 Site, Puna, Island of Hawaii. Maile
Kjargaard, P.O. Box 476, Volcano, Hawaii.**

Presents a summary of a faunal survey of the proposed SOH 4 site. The survey documents the existence of habitat for the Hawaiian hoary bat and the Hawaiian hawk. The site is also good habitat for a number of native Hawaiian birds. The habitat quality is based on the proportion of native vegetation that exists on the site. The site is an important resource because it is one of the few remaining low elevation sites that facilitates the study of native species adaptation to introduced avian diseases.

**Background Document for Proposed
Geothermal Rules and Proposed Hydrogen
Sulfide Ambient Air Quality Standards, no
date.**

Consists of a background document produced by the Hawaii State Department of Health that provides information on the proposed (at the time of document creation) rules for geothermal emissions and standards for ambient air concentration of hydrogen sulfide (H_2S). The document details the reasoning behind the proposed amendments to State of Hawaii administrative rules,

Chapters 11-59 and 11-60. These amendments would dictate H_2S ambient air standards and air pollution control, respectively. Information was also given regarding control technologies to control H_2S emissions and subsequent emissions standards. This would generally be reflected in new air permit requirements.

**"Report on the October 1987 Hawaiian HGP-A
Power Plant Overhaul and Reservoir
Production Data," *Transactions of the
Geothermal Resources Council*, vol. 12.**

Presents the detailed plan to overhaul equipment at the HGP-A facility. Included are investigative results of the equipment and a history of the operational parameters.

**Letter from Duane Kanuha, Planning
Director, to Dr. John P. Craven May 5, 1989.**

Refers to Special Permit No. 392: HGP-A Geothermal Research Station TMK : 1-4-01: Portion 2; a request for information to determine if the special permit is being followed.

**Official complaint (letter from Jennifer Perry
to Duane Kanuaha, Director, Planning
Department, County of Hawaii), no date.**

The official complaint was recorded by the Planning Department County of Hawaii. Ms. Perry complains of health effects from venting of the HGP-A plant.

**"Geothermal Give-Away At Taxpayer's
Expense", letter by Gregory C. Pommerenk of
Pahoa, Hawaii, no date.**

Hawaii "gave" HELCO the potential to make huge profits from geothermal development of HGP-A by waiving royalties

from mineral rights and paying for repairs to HGP-A with taxpayer appropriations. Mr. Pommerenk states that there has been "major land devaluation" because "the geothermal mongers who are drilling at the geothermal give-way" are "scaring possible buyers away with their noise and stink and ugly power plants."

Letter from Barbara Bell, Kapoho Community Association Acting President, to Gary Mizuno, Chairman of the County of Hawaii Planning Commission, no date.

Requests that the HGP-A plant be shut-down. The letter specifically reports high ambient air concentrations of H₂S after an abatement system failed.

Letter from D. Thomas, University of Hawaii at Manoa, to J. Huinsingh, Natural Energy Labs of Hawaii.

Discusses the physical and chemical characteristics of HGP-A and KS1-A well brines.

Board of Land and Natural Resources State of Hawaii, Findings of Fact, Conclusion of Law, and Decision and Order, April 9, 1985.

Contains the rulings from the hearings on the parties' proposed findings of fact and the conclusions of law represent the Board's considered and collective judgement on the designation and boundaries of the Kilauea Middle East Rift as a Geothermal Resource Subzone (In the Matter of the Designation of the Kilauea Middle East Rift, Island of Hawaii, as a Geothermal Resource Subzone.

Before the Board of Land and Natural Resources State of Hawaii, Decision and Order, In the matter of the Conservation

District Use Application of the Estate of James Campbell, April 11, 1986.

The Board of Land and Natural Resources grants the Estate of James Campbell and the True/Mid-Pacific Venture a Conservation District Use permit. The outline of the permit is included.

Letter from Dr. John Lewin, Department of Health, State of Hawaii to Delan and Jennifer Perry, September 20, 1989 regarding construction permit to True Geothermal Energy Company for 12 exploratory wells.

Provides responses to concerns about contamination of water catchment, saying air emissions will be temporary, no long term adverse effects are anticipated. Response on air emissions. The Department of Health requires mandatory testing of each well for constituents. Contains copy of permit (ATC) No. A-815-768.

Letter from True Geothermal Energy Co. to Paul Aki, Chief Air Quality Permits Branch, DOH, November 24, 1989.

Discusses the location of air quality monitoring station with respect to first drilling site.

**Hawaii Administrative Rules Title 13
Department of Land and Natural Resources
Sub-Title 7. Water and Land Development.**

Includes Chapter 185 Rules of Practice and Procedure for Geothermal and Cable System Development Permitting. The chapter establishes guidelines and procedures for consolidated geothermal and cable system development permitting.

Letter from Bernard Akana, Mayor County of Hawaii, to Jennifer Perry, January 23, 1990.

Refers to Mr. Perry's resignation from the Geothermal Advisory Commission which advocates safe, responsible development of geothermal energy. Mayor Akana thanks Ms. Perry for her time and interest.

Letter from Donald M. Thomas, Associate Geochemist, University of Hawaii, to Jennifer Perry, June 26, 1990.

Replies to a request from Ms. Perry to obtain a copy of Mr. Thomas' work at HGP-A. Mr. Thomas has passed the letter on to the office of the V.P. for University Relations due to current litigation.

Air Dispersion Model Data, no date.

Provides air dispersion model data from the PTPLU model. This modeling was for the June 1986 venting of well 815c. The data relates plume characteristics and downwind concentrations of air pollutants under a variety of meteorological conditions.

He Ola'i, Earthquakes in Hawaii, State of Hawaii Civil Defense, no date ..

A brochure distributed to the public by the Hawaiian Civil Defense authorities informing citizens of protective actions before, during, and after an earthquake.

Letter from Mark Dellinger to William Kikuchi, representative to Senator Inouye, February 27, 1990.

Believes an integrated resource management program with responsive public hearing process facilitates the development of geothermal resources.

"Working it Out: Geothermal Conflict Resolution in the Geysers" by Alex Hinds, Bob Reynolds, and Mark Dillinger.

In Geothermal Resources Council Transactions, Vol. 14, Part II, pp. 1141-1148, August 1990.

Article about Boron Deposition on Soil and Native Vegetation from Geothermal Emissions by F. J. Lang, F. T. Bingham, F. F. Hendrix, and N. L. Crane. J. Environ. Qual. 15(3):260-264, 1986.

A study of boron emissions from cooling towers of two geothermal generating units.

Letter from True Geothermal Energy Co. to Dennis Lau, Chief Environmental Permits Branch, Hawaii Department of Health, April 11, 1989.

Summarizes air and water emissions during geothermal well construction as well as mitigation measures.

Letter to Mr. Paul Aki, Chief Air Quality Permits Branch, Department of Health, Hawaii, from the True Geothermal Energy Company, November 24, 1989.

The letter discusses a diagram showing first drilling site in the KMERZ and air quality monitoring station's location relating to the first drilling site.

U.S. Environmental Protection Agency (EPA) comments on the Notice of Intent (NOI)

EPA's three-page letter with nine pages of comments covers 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.

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 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. A plan to prepare supplemental documents under these conditions should be acknowledged 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.
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 to the proposed action 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. Reinjection alternatives should be considered.
6. The EIS should address downscaled geothermal program combined with other energy sources, e.g., solar and wind.
7. The EIS should compare per-capita energy consumption in Hawaii relative to other areas and states.
8. The EIS should consider environmental hazards for each alternative energy source.
9. The EIS should identify and discuss pollution prevention measures for geothermal well sites, alternatives to drilling, and development of geothermal resources.
10. The EIS should identify DOE's perception of federal government's role in geothermal development if DOE does "not partially fund" HGP.

11. 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.

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.
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 rainforest.
3. Quantify the amount of rainforest 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.

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.

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.

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 Office (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. Address impacts on speleology.

National Park Service, Hawaii Volcanoes National Park, letter from Hugo Huntzinger responding to solicitation for comments, dated April 14, 1992.

The EIS should address potential impacts to Hawaii Volcanoes National Park (HVNP), a Prevention of Significant Deterioration (PSD) Class I area. An evaluation of impacts resulting from emissions of hydrogen sulfide and criteria air pollutants should be conducted. The EIS should analyze potential loss of Air Quality Related Values (AQRV) including vista degradation, noise, and odors. Mitigation measures should be discussed.

Fax from Dan Taylor [letter is signed for Hugo Huntzinger, Superintendent], NPS, April 14, 1992.

The National Park Service offers the following in response to the solicitation for comments on and EIS for the development of a geothermal well field near Hawaii Volcanoes National Park:

1. The Park is concerned about the potential for air contamination which might affect native plants and animals or might adversely affect the health of visitors and employees. An unbiased analysis of point source emissions needs to be directed.
2. The proposed development might degrade Air Quality Related Values (AQRV) which are important to the Park's mandate to manage the backcountry for wilderness values.
3. There is concern over the introduction of industrial land use in a region characterized by conservation, agricultural and rural land uses.

Letter from Clyde S. Murley, Natural Resources Defense Council

This letter was written in response to the NOI soliciting scoping comments for the HGP EIS. NRDC points out that NEPA implementing regulations state that the treatment of alternatives is the heart of the EIS. Therefore, NRDC comments focus on the following three areas:

1. The underlying need and purpose for the HGP. The need and purpose should be expressed in terms of a set of energy services (e.g., lighting, cooling, motive power) and not simply electricity as such. Thus, alternatives considered in the HGP EIS should include more efficient and efficacious use of energy (i.e., DSM) and alternative sources of generation.
2. Project alternatives to the HGP.
3. Comparisons among alternative projects, of which the HGP is one.

In addition, NRDC makes the following points.

Project Need and Purpose

1. DOE should prepare a preliminary draft defining the project need and purpose, and developing the alternatives, and put this out for public comment before issuing the Draft EIS. Though nonstandard, NRDC believes that this extra cycle of public comment would save time and money in the long run, should the preliminary draft "need and purpose" statement require significant reformulation.

Alternatives

1. A reasonable standard of feasibility should be applied to screening alternatives. Options should not be eliminated from consideration because all of the conditions for implementing them

currently are not in place. Changes in legislature, policy, regulatory, and market environments may be required; a readiness to consider these changes should be presupposed when considering alternatives.

2. Project alternatives should not be limited to single projects of comparable size to the HGP. Multiple and diverse smaller projects collectively producing the same (or superior) net effect are fully satisfactory.
3. A full study of the potential (including the development of an appropriate database) for meeting energy service requirements through DSM is essential. The study must consider the ability of regulatory agencies and utilities to enhance this potential. Without this study, the EIS cannot be prepared properly.
4. Estimates of DSM resources should not be limited by narrow cost-effectiveness criteria. A simple, direct market cost comparison between DSM and HGP will fail to capture the environmental and societal benefits generally associated with DSM. Accounting properly for DSM's environmental and societal benefits will have the effect of enlarging the DSM resource.
5. Comparisons of alternative approaches with the HGP must consider the time-varying flow of costs and benefits over the next 40-50 years (the lead time and the operating lifetime of the proposed HGP). Many — perhaps all — of the alternatives are modular, whereas the HGP is not. Projects implemented progressively over time are better able to match capacity growth with need than a project (the HGP) that comes on line all at once. Over a 40-50-year period, many technologies that are not now fully developed may become commercial and cost-effective; other technologies' costs may increase over time. All of these considerations should be accounted for in

the development of project alternatives and in comparisons among project alternatives.

6. Consider the use of decentralized energy sources to replace electricity from the grid (e.g., solar water heating with LPG instantaneous backup).
7. To the extent that the HGP is represented to provide environmental and independence benefits (e.g., reduced need to import or transport oil; reduced emissions of NO_x, SO_x, particulates, and CO₂), the analysis of DSM and other alternatives also should consider such benefits, if appropriate.
8. Because the DOE timetable for completing studies and analyses necessary to prepare an adequate EIS is very ambitious, the analysis of alternatives may not be as complete as it should be. Therefore, DOE should include among the project alternatives an array of options in which the decision on HGP is deferred while studies continue and DSM programs with short lead-times are pursued aggressively. Deferring the date by which the energy service resource needs identified in the EIS are needed will provide time to make a better decision on the best way to supply Hawaii's long-term needs.
9. The EIS should evaluate project alternatives in light of worldwide environmental issues and problems. Global per capita energy use cannot increase the present U.S. per capita levels in any sustainable way. To increase Hawaii's electric generation capacity by 30% (as the HGP would do) without first demonstrating a commitment to maximizing the efficiency of energy use seems profoundly inappropriate. Additional weight should be given to project alternatives that better reflect the fundamental objectives of sustainable energy development, both in Hawaii and globally. In this regard, U.S. actions in

the energy arena should serve as a model for other countries to follow.

Letter and submittal from Dr. Fred D. Stone, Science Instructor, General Education Division, Hawaii Community College, postmarked April 8, 1992.

Submits a copy of the "Survey of Lava Tubes in the Former Puna Forest Reserve and on Adjacent State of Hawaii Lands" as written testimony in relation to the Notice of Intent to Prepare an EIS and Conduct Public Scoping Meetings for Phases 3 and 4 of the HGP. The letter indicates the use of the lava tubes by Native Hawaiians, important populations of native cave-adapted species, and rich fauna of endemic Hawaiian invertebrates. Dr. Stone suggests the lava tubes and the overlying native ecosystems be fully investigated in any EIS relating to geothermal development in Hawaii.

***Survey of Lava Tubes in the Former Puna Forest Reserve and on Adjacent State of Hawaii Lands* by H. McEldowney and F. D. Stone, prepared for State Historic Preservation Division, Division of Water Resource Management, Department of Land and National Resource, State of Hawaii, October 1991**

The survey (1) establishes whether or not lava tubes continued into the land now held by Campbell Estate or the Geothermal Sub-Zone; (2) assesses the extent to which any lava tube systems found contains Archaeological remains or burials and, if so, to evaluate their general significance; and (3) defines, if possible, any patterns in the distribution of the lava tube systems or the archaeological remains within them.

All of the remain submissions were submitted during the comment period for the ANOI, published September 3, 1991.

Jim Albertini

Submitted a flyer prepared by the Big Island Rainforest Action Group and the Pele Defense fund. It offers 10 reasons for opposition to geothermal projects: (1) destruction of the rainforest; (2) violation of native Hawaiian religious beliefs; (3) illegal land swap of Hawaiian ceded lands; (4) health threats from H₂S; (5) pollution from other toxic wastes; (6) dangers of earthquakes and lava flows; (7) cost of project, leading to higher taxes and electric rates; (8) need to use alternative sources; (9) growth of unwanted industries; and (10) violation of community's right to self-determination.

Anonymous

Sent a copy of a flyer published by the Pele Defense Fund entitled "Geothermal on the Big Island? Ugly, Toxic, Costly & Sacrilegious." It expresses 12 concerns: (1) Geothermal project will adversely affect rainforest, a National Park, and neighborhoods; (2) drilling violates religious beliefs of Native Hawaiians; (3) H₂S emissions are toxic and will affect tourism; (4) earthquakes and lava flows make area too dangerous; (5) venting results in noise pollution; (6) cables will affect scenic resources; (7) large amounts of power generated will lead to rampant industrialization; (8) other undesirable industries (e.g., ocean mining) will be enticed to the area; (9) local economics will not benefit; (10) the expensive undersea cable will lead to higher utility rates and higher taxes; (11) cost of cable is being underestimated; and (12) wind, biomass, solar, waste heat recovery, more efficient architecture, and conservation are better alternatives.

Bonnie P. Bator

Believes EIS should study (1) sociocultural impacts, (2) a comparison of Hawaii's H₂S concentration with that at The Geysers in California and at other geothermal power stations, (3) the cumulative effects of H₂S and other toxic components of geothermal steam and brine, (4) the effects of EMF, (5) the *Social Impact Management Program* given as Appendix C of Kahauale'a Geothermal Project EIS (April 1982), (6) the no action alternative, (7) the industries that would most benefit from geothermal development. Also feels conservation and efficiency are better alternatives.

Earl Dunn, Jr., President, Citizens for Responsible Energy Development

EIS should address: the extent and reliability of the geothermal resource, waste management, alternatives (e.g., conservation), possible disruption of normal operations by geological or terroristic activity, and the economics of the overall project.

Carl Freedman, President, Blue Ocean Preservation Society

Letter first requests that the Society receive "any notices or public announcements regarding" the EIS and any announcements of opportunities to participate in the public scoping process. Also presents list of subjects that the Society feels should be included in the EIS: (1) direct economic impacts (true magnitude of the costs, expense of building back-up systems, and impacts of geothermal/cable costs on electrical utility rates); (2) indirect economic impacts (effect of the project upon the planning flexibility of Hawaii's utilities, interruptions of service if there is a cable failure, possibility of decreased future availability of geothermal resources) (3) potential unplanned

contingencies (possibility that the project will not be completed, possibility that the project will be completed and later rendered inoperable); (4) alternatives (no action, solar, deferral of project for 20 to 30 years).

William R. Halliday, Chairman, Hawaii Speleological Survey, National Speleological Society

Offers to perform, at no expense to the government, the speleological field work necessary for the EIS. Also offers to come to Washington, D.C., for planning efforts and would like to be contacted about the joint planning. Letter also includes a motion passed by the Board of Governors of the National Speleological Society that calls for halting all construction in Wao Kele O Puna and Ahihi-Kinau areas until an EIS is completed (with participation and review by the National Speleological Society).

Brad Houser

(submitted by FAX, 12/7/91). Believes the EIS should be structured in two phases. Phase I would be a comprehensive integrated Resource Plan for a new baseload HELCO generation plant. It would examine the 25-MW Ormat plant and practical alternative baseload systems to satisfy the immediate baseload generation shortfall on the Big Island. Phase II, drawing upon the technology assessment of Puna geothermal electric production done in Phase I, would examine the broader Hawaii Geothermal/Cable Project. The State's intention is to provide Oahu with additional electric power from the Puna geothermal resource. Phase II should also encompass technology assessments of various types of Oahu-based generation plants, fuels, and energy sources, including the possibility of geothermal wells on Oahu.

Robert P. Jacobson and Julie S. Hedgecock-Jacobson

This submission is a copy of the writers' correspondence to their attorney regarding geothermal development. Also included is a copy of testimony they presented at a public hearing in June 1991. Letter to attorney suggests that their health problems may be attributable to geothermal emissions. Property value has decreased. Experience has been stressful. In the testimony, the writer expresses concern about health and safety, effects on the rainforest, property values, maintaining homeowners' insurance, deleterious effects on houses and water supply, and psychological stress of geothermal development on nearby residents. A postscript to this submission asks that emissions of mercury and other toxics be evaluated.

Maurice H. Kaya

[submitted a copy of a letter from Murray E. Towill, Director, Department of Business, Economic Development & Tourism, to Mr. J. Michael Davis, Assistant Secretary, Office of Conservation and Renewable Energy, U.S. Department of Energy]. The letter explains that DBED and DOE should serve as "joint lead agencies in preparing the EIS."

Andrew C. Kier

[sent 2 similar letters with the same date, one marked "final draft."] The project area is residential/agricultural, creating a land-use conflict with the industrialization represented by geothermal. Plant emissions have and will adversely affect air quality and cause health problems. Well casing failure and reinjection of fluids could result in contamination of groundwater. Solid and liquid waste treatment systems will result in wastes that contaminate air and water. Geothermal may

cause induced seismicity; subsidence of the field also a problem. Flora, fauna, critical habitat, and the rainforest will be significantly impacted; new species will invade. More benign energy alternatives should be explored.

Anne Lee

Concerned about venting, noise, emissions, disposition of wastes, air quality degradation, human health effects, and effects on the rainforest.

Harold S. Masumoto, Director, Office of State Planning, State of Hawaii

Responding to the list of environmental impacts given in the ANOI, Mr. Masumoto believes the list should be expanded along lines explained in the letter. See Attachment 1.

Steven M. Moser, M.D.

Submitted an outline (see Attachment 2) of topics that should be covered in the EIS. His general concerns are environmental degradation, accidents, effects of geothermal development on the rainforest, effects of electrical transmission, and nuisance effects.

Noreen Parks and Sean Stehura

Believe the project should not proceed unless the 20-year history and enviro-social impacts of geothermal development are studied (i.e., accidents, poor monitoring). Question who will benefit from geothermal. Undesirable industries and commercial development will be attracted to the area, causing higher electric rates for the people who would not benefit. Conservation and alternative sources are a better choice. What

will be the impacts of the cable system on habitats and endangered species? What are the human health risks of EMF? What are the effects of the submarine cable, and what if it ruptures? How much power will be lost in such a long transmission line, and has this loss been factored into the costs and benefits? What will happen if there are more blowouts?

Delan Perry, Secretary, Big Island Papaya Growers Association

Concerned about loss of agricultural land to geothermal development. Feels EIS should evaluate adverse effects of taking papaya land out of production; H₂S emissions on papaya flowers and fruits; fluorine, boron, and particulate emissions on fields; contamination of groundwater resources that have agricultural and domestic potential; soil acidification because of H₂S emissions; and mitigation of adverse effects.

Henry Ross

Requests to be "a consulted party to the EIS" and to receive a copy of the ANOI. Also enclosed two newspaper articles that he wrote regarding geothermal development: (1) "The Deception of Alternate Energy," letter to the editor, *Hawaii Tribune-Herald*, Sept. 29, 1991. The article states that geothermal is an ineffectual alternate energy source because current and future power needs can be met by burning residual fuel oil from Honolulu refineries, as is currently done, and by conservation. (2) "Gov. Waihee Ill-Advised on Geothermal Development," Viewpoint, *West Hawaii Today*, Aug. 18, 1991. The article is an editorial-style condemnation of geothermal and states that geothermal would not reduce Hawaii's dependence on fossil fuels.

Russell E. Ruderman

Points out that "geothermal has never been done safely and successfully in an active volcanic region anywhere in the world." Resource may be depleted quickly. Geothermal will cause earthquakes. There is no effective technology to deal with volcanic forces safely. Letter also includes three articles written by Mr. Ruderman and published by the Big Island Rainforest Action Group. The first, "Geothermal In Hawaii—A Mistake We Cannot Afford," expresses concerns about geologic hazards, cost, health and safety, native Hawaiian culture, and rainforest destruction. It also calls for increased energy efficiency and the use of true renewables. The second, untitled article and the third article, "Geothermal Is Unacceptable In Hawaii," offer similar criticisms of geothermal development.

Penny Shauer

Believes her family's health is being adversely affected by well venting. Project is too close to residential areas. Project will harm rainforest.

Rene Siracusa

Letter points out previous problems with geothermal: work hours violations, dumping of hazardous waste, uncontrolled venting, noise, desecration of religious sites, failure to comply with permit requirements for control of exotic weeds, and monitoring only for H₂S. The rainforest will be irrevocably damaged. Earthquakes/seismic events may be a serious problem. Blowouts may cause human and other ecological health effects. Human error is possible even with the best technology. HGP-A had many problems. The SOH program has also affected nearby residents (noise, fumes, etc.). The writer also offers to share copies of her files pertaining to

geothermal development and its effects (e.g., personal birdwatching logs and correspondence with Hawaii Dept. of Health).

William D. Smith

Believes "Officials of the State of Hawaii have an unhealthy fixation on geothermal energy" and that geothermal is not the clean, stable source of energy it has been portrayed to be; it is more expensive and more dangerous than solar, biomass, etc. Need improvements in regulatory oversight, accident analysis, emergency response, health effects (particularly H₂S). Believes energy demands are the result of excessive tourism development: limit tourism (i.e., change the State's economic base) and energy needs will be less. State and Federal governments have ignored the laws and evidence regarding geothermal to push ahead with an undesirable project. The writer quotes from several State reports to support his assertions. He also asks to be "on your list of consulted parties" and to be "informed of each step of your work."

**William B. Snorgrass, public safety
chairperson for the Puna Community Council**

Concerned about health and safety effects of the wells on residents. Questions State Department of Health's assertion that there will be no adverse effects from H₂S. Also concerned about land use and economic impacts; degradation of air, water, and land; use of resources (particularly water); geological considerations; and effects on the rainforest.

Jim Snyder

Opposed to geothermal because of its effects on rainforest. Other concerns are

(1) existing developments have harmed rainforest and have had blowouts, (2) geothermal is not a renewable resource, (3) true renewables could be developed in Hawaii, (4) geothermal development will contribute to other environmentally destructive endeavors, (5) religious and cultural practices of native Hawaiians are being violated, (6) project may have massive H₂S release, and (7) land degradation and severe marine impacts may result from the project. The letter also includes a petition/resolution supporting the protection of the Wao Kele O Puna rainforest from economic development.

Murray E. Towill, Director, Department of Business, Economic Development & Tourism, State of Hawaii *DATIE?*

The letter "responds to Ms. Deborah L. Louison's September 3, 1991 letter to Governor Waihee which solicited comments on the proposed scope and content of the EIS for Hawaii's Geothermal Program." The writer asks that "the terms 'Hawaii Geothermal Project' as well as 'Phases I, II, III and IV'" be avoided because they "do not accurately convey Hawaii's past, present or future actions relating to geothermal development in Hawaii." Also believes the EIS should explore all alternatives, including "undesirable economic, energy security and environmental impacts for Hawaii if the State continues to rely on imported petroleum." Air quality should include "well, gathering system and power plant upsets." Points out that the EIS is legislatively required to be a joint state-federal effort and that his Department's offer of cooperation has not received "a substantive response."

Paul J. von Hartmann, Director, P.E.A.C.E. (Progressive Economic Alliance Cultivating Energy)

Concerned about EMF generated by the undersea cable and cites several published studies to support his assertions. Believes the cable will introduce an electrical stimulus into the birthing and nursing habitat of humpback whales; this stimulus will attract and increase the aggressiveness of sharks. Sharks could also be attracted to areas where humans swim. Further, whales and other cetaceans may have their biomagnetism abilities disoriented by the EMF; the writer feels that the cable would therefore violate the Marine Mammal Protection Act and the Endangered Species Act. Efficiency, conservation, and biomass are better alternatives. Also, the economic benefits of these alternatives would decrease the demand for growth by decreasing Hawaii's reliance on tourism.

Packet 1 also contains two report-length submissions, which are summarized below.

Overview of Proposed Geothermal Development in Hawaii, prepared by Concerned Individuals and Organizations in Maui, February 15, 1990.

The text of the report states that geothermal development is economically and environmentally unacceptable. Further, the authors feel that the State has foolishly pressed ahead with a project that is unwise and has misrepresented facts. They feel that the project should be stopped until 15 considerations and procedures have been addressed:

1. Direction of the geothermal development program is by a State department, not the electric utility involved.
2. Detailed cost estimates should be prepared. Previous estimates are

- sketchy and erroneous. An oil-fired plant would be less expensive.
3. HECO has relied on inaccurate and deceptive estimates and studies prepared for proposals, not on a professional cost estimate.
 4. The utility should prepare an economic feasibility study. The authors estimate a 50% increase in power bills for consumers on Oahu.
 5. Geothermal would increase taxpayers' cost by \$2.6 billion over and above an oil-fired plant.
 6. An alternative source such as geothermal should not represent such a major part of the utility system (i.e., 500 MW), especially if it "meant a significant rate shock."
 7. Geothermal would not reduce Hawaii's dependence on oil, because the largest use of oil products is transportation fuel.
 8. DBED and HECO should concentrate on a program of conservation.
 9. Geothermal is not a proven safe and reliable resource in an environment such as the Kilauea rift zone.
 10. Geothermal is not a clean energy source (e.g., air quality, corrosive saline fluids).
 11. The submarine cables will be laid in seismically active areas. Repair time and costs would be huge. Other cable types (i.e., paper insulated mass impregnated cable) would be better.
 12. If geothermal is to be developed, a smaller facility should be considered so that information and experience could be gained before constructing a large facility.
 13. Geothermal is not a renewable resource. Some existing projects (Iceland, Japan) have had serious problems, including low plant output.
 14. Long-term testing of the resource is necessary to demonstrate its availability.

15. A comprehensive EIS should be completed and should evaluate the no action alternative.

In support of the ideas in the report, the authors include Exhibits A through Q:

Exhibit A: "Geothermal Could Be a Costly Mistake," Editorial, *The Maui News*, Sunday, Dec. 10, 1989.

Exhibit B: (1) "More Than One Side," letter to the editor, *The Maui News*, Jan. 16, 1990; (2) "State Is not Giving Us the Straight Story on Geothermal Energy," Commentary by Jim Williamson, *The Maui News*, Jan. 28, 1990; and (3) DBED internal memorandum regarding State financial support for the geothermal project.

Exhibit C: *An Assessment and Critique of: Department of Business and Economic Development Economic Feasibility Analysis Regarding the Hawaii Geothermal/Underwater Cable Project*, Carl Freedman, Dec. 4, 1989.

Exhibit D: *Energy Efficiency and Least-Cost Planning: The Best Way to Save Money and Reduce Energy Use in Hawaii*, Robert J. Mowris, prepared for the Rainforest Action Network, San Francisco, Calif., January 11, 1990.

Exhibit E: "Perfectly Clear," a statement by Robert Petricci, area resident.

Exhibit F: (1) "Permit for Geothermal Wells Has Strict Rules," *The Maui News*, Feb. 11, 1990; and (2) "Standards Not Good Enough," letter to the editor, *The Maui News*, Feb. 19, 1990.

Exhibit G: Photographs of "tree kill and polluted settling pond" near HGP-A.

Exhibit H: (1) "A Bill for an Act Relating to Geothermal Environmental Tax Credits," in the Hawaii Senate, S.B. No. 3415 (killed in committee); and (2) "Testimony by representative of

Maui citizen groups," presented regarding S.B. 3415, Feb. 9, 1990.

Exhibit I: "Geysers Failing," Steven H. Heimoff, *The Tribune* (Oakland, Calif.), Nov. 5, 1989.

Exhibit J: Geothermal Resources of the Kilauea East Rift Zone, William L. D'Olier, April 1989 (Appendix A of HECO's April 1989 RFP to develop the 500-MW geothermal cable project).

Exhibit K: "Boron Deposition on Soil and Native Vegetation from Geothermal Emissions," F. J. Lang, F. T. Bingham, F. F. Hendrix, and N. L. Crane, *Journal of Environmental Quality*, vol. 15, no. 3 (1986), pp. 260-64.

Exhibit L: "Environmental Damage During Geothermal Well Testing," d'E. Charles Darby, Auckland, New Zealand [publication information not given].

Exhibit M: "Protection Policy for Hawaii's Native Wildlife During Geothermal Energy Development," Lee Hannah, *Environmental Management*, vol. 10, no. 5 (1986), pp. 611-21.

Exhibit N: "Geothermal Hazards. Mercury Emission," Sanford M. Siegel and Barbara Z. Siegel, *Environmental Science and Technology*, vol. 9, no. 5 (May 1975), pp. 473-74.

Exhibit O: "Abstract of Testimony Presented at the National Energy Security Hearing, Honolulu, Hawaii, January 11, 1990," Hampton L. Carson, Professor Emeritus, John A. Burns School of Medicine.

Exhibit P: "Bulldozing Hawai'ian Rainforests to Fuel Development," *Earth Island Journal*, Winter 1990, pp. 22-23.

Exhibit Q: (1) "Energy Project Imperils a Rain Forest," Timothy Egan, *The New York Times*, Jan. 26, 1990; (2) "Battle Over Hawaii Geothermal Plant Heats Up," Susan Essoyan, *The Los Angeles*

Times, Dec. 10, 1989; and (3) "Killing of Puna Rain Forest Is Multifarious Desecration," Ron Stief and Julian Kunnie, *National Catholic Reporter*, Dec. 29, 1989.

Kapoho Community Association Comments Regarding Federal EIS on Phases 3 and 4 of the Hawai'i Geothermal Project, Oct. 3, 1991.

The cover letter states that the "state-designed 4 phase program lacks the necessary regulatory infrastructure for the implementation of each phase, as has been experienced by the Puna community with HGP-A and the SOH program."

The letter asks that the following issues and questions be addressed:

1. What is the Federal Government interest in the cable and geothermal development in Hawai'i? How is the data being sought for cable development applied to other national interests, such as national defense readiness in the Pacific?
2. How can you complete an EIS when the precise location of sites for geothermal power plants will not be known until the State completes the currently planned resource verification and characterization program on Hawai'i?
3. What would the impact be on phases 3 and 4 in the event that the SOH sites drilled by the State are subsequently found to be too close to existing residences, farms, and native forest land to be safely developed?
4. What would be the adverse impact of the project if the State of Hawai'i does not process in a timely manner the Kapoho Community Association's Withdrawal from Geothermal Resource Subzone Designation of their interest in property as allowed by law?

5. What impact will result from not requiring an EIS for Subzone Designation in evaluating potential sites for phases 3 and 4?
6. What impact would result from State law not requiring that an EIS be completed for privately funded projects on private lands in the development of the HGP? How can a Federal EIS address specific sites in this case?
7. What impact would result if the GRS designation does not require an EIS, nor does the developer on private land with private funds, in the responsible development of the HGP if the NEPA document does not address specific sites?
8. How would the impact of a lawsuit filed by landowners to challenge the subzone designation because of deficiencies in the public proceeding be dealt with in proceeding with Phases 3 and 4?
9. What would be the economic impact if there were not sufficient recoverable thermal energy contained in the resource to satisfy the 500-MW plan? How would the investment in the cable be justified?
10. What economic negative effect would occur if developers are not encouraged to invest in more exploration because of resource limitations in terms of sustainability and chemical makeup (particulates, H₂S) even after the Federal and State funds are expended?
11. If downhole surveys establish that steam is being tapped from under neighboring properties, how would that affect permitting, ownership, mineral rights and payment of royalties?
12. What are the impacts to property rights of residents who are forced to relocate as a result of development activities?
13. What would be the effects on agricultural crops such as fresh fruit and flowers when exposed to unabated emissions during open venting and upset conditions?
14. How do the present forest categorization procedures compare to other categorization procedures used?
15. How would the loss of one or several power plants be mitigated in terms of lost generating capacity?
16. What would the adverse effects be if a geologic hazard interrupted for any length of time transmission capabilities over land or under sea?
17. How are the geologic hazards of placing a power plant on an active rift considered in the economic planning of the 500-MW proposal?
18. What would be the economic effect if the cable project is not financed virtually completely by private industry? What would the costs be to taxpayers if the State and Federal governments had to finance the two remaining phases?
19. Will a back-up generating facility be needed in case of transmission failure in the cable project? If so, what would that entail?
20. What difference will geothermal development have on the State's total oil importation and total oil consumption, including air and ground transportation and military use?
21. How and where would baseload supply from geothermal plants be used throughout a 24-hour period, considering all ranges of production up to 500 MW?
22. What adverse effect would there be to investment in phase 3 and 4 if it is proven that there is inadequate steam supply for 500 MW? Who would pay?
23. What kinds of industry would the increased generation (500 MW)

- support in terms of development in the State and on Hawai'i?
24. What would be the adverse economic, safety, and technical considerations as a result of resource testing and chemical analysis being proprietary? At present, the proprietary information is unavailable to government agencies for permit review, designing power plants, abatement systems, monitoring programs and determining BACT.
25. What would the adverse impact be to air quality under the following:
- No rapid shut-in capabilities for Hawai'i wells in the event of the loss of transmission or other upset.
 - Failure in electrical transmission overland or undersea resulting in cumulative effects of up to 150 wells venting to the atmosphere, initially unabated.
 - Synergistic effects of an unabated 1300-ppm H₂S content particulate matter, heavy metals, and total chemical constituents contained in Hawai'i's resource during flow testing, well blowouts, well cleanout, pipeline cleanout, and well workover.
 - Cumulative effects of volcanic emissions and geothermal emissions during vog episodes and unscheduled or scheduled unabated releases.
26. What are the alternatives and solutions to unabated venting for all steam constituents of the wellbore, pipeline cleanout, well workover, and abatement technology limitations in development of a 500-MW project?
27. What events would cause transmission failure over land or undersea? What would be the effects of each event?
28. If reinjection of non-condensable gases and brines fails, what contingency plan would have to be in place, other than a variance, to allow the venting of non-condensables or condensibles and surface ponding of fluids?
29. What is the negative effect of inadequate meteorological monitoring studies on the worst case computer modeling scenario?
30. How would the DOE or other Government agency address the contamination of groundwater resources within the geothermal resource subzones if the State of Hawaii succeeds in exempting the groundwater under the GRS from UIC requirements and water quality standards?
31. What will be done to make the noise emissions compatible with the existing community, be it humans or agriculture lands or forest?
32. How many wells would be vented per week in a 500-MW scenario, a possible 80 decibels for 4 hours? What effect will that have on residents and wildlife?
33. What Government agency will be charged with enforcement of all permit conditions and/or changing realities once a permit is approved?
34. What fines will exist to induce any developer to comply with their permit?
35. Who will be able to go on site for inspections with short-term notice given to the developers, be it private or federal?
36. What are the adverse impacts to the Hawai'i Geothermal Project of an inadequate State regulatory and statutory infrastructure in carrying out the intent of phases 3 and 4?
37. Are the State statutes regarding geothermal development permitting and regulatory structure adequate for responsible and safe research and development of phases 3 and 4?

38. What effect would the adequacy of those statutes have on the negative impacts of development of 500 MW?
39. What is the definition of "Regulatory Authority"?
40. What would be the effect on the Hawai'i Geothermal Project if a developer challenged statutes that made steam a mineral, subject to royalties? What would the economic effect of loss of these revenues create for the HGP?

The remainder of the report is a copy of the Kapoho Community Association's petition (to the Bureau of Land and Natural Resources) to have certain properties withdrawn from the Geothermal Resource Subzones and to establish a 2.5-kilometer buffer zone from any geothermal activity.

Thomas L. Aitken

Opposed to geothermal development within 10 miles of any residence. Geothermal technology has been poorly applied. Project should be shut down.

William and Rose Atkins

Believes existing well emissions caused their headaches and sinus problems. The June 1991 blowout was a source of serious concern. Project should be shut down or moved to a more remote location.

Wally Backman, Science Advisor, Citizens Advocating Responsible Education

Believes the 1978 EIS for HGP-A offered an erroneous view of the well as being environmentally benign. Residential areas are too close to geothermal development sites (e.g., H₂S emissions are dangerous). Volcanic

eruptions/earthquakes could destroy power plants in the area and cause the release of more toxic fumes. Geothermal development companies should put up a bond at least equal to the value of all the homes and property in the area. Local ecology is threatened by acidic gas emissions. The steel pipe in the wells will not last.

Burton Brees

Feels the existing geothermal well has ruined his subdivision and has caused him to be physically ill. He believes nearby residents should be relocated at government expense.

Cindy Bryan

Believes family was "poisoned" by existing well; had to leave home for 6 weeks. Has several questions: What are the long-term effects of exposure to emissions, and how much worse will the emissions be with 200 wells? What if more than one well blows out? How many people live in the affected area? Why are there no monitoring systems? What is the effect on sea life? Are the "slime pools" of waste affecting the water table? Why waste the rainforest?

Suzanne E. Byrne

Believes geothermal development will increase the risk of a wide-scale disaster. The Puna area is too geologically active and complex. Lava flows have already closed evacuation routes.

David A. Caccia

Believes geothermal is neither clean nor safe. Emissions of concern include H₂S and heavy metals. Geothermal power will attract

additional heavy industry. Unique flora and fauna will be adversely affected.

Eleanor T. Cate

Opposed to geothermal development.

Sharon A. Clark

Project should not continue unless a majority of Hawaiians want it. Wind and solar energy sources are more feasible and acceptable.

Pam J. Cooper

Sees geothermal as less dangerous than nuclear power but still "highly dangerous." As a nearby resident, feels geothermal explorations have caused physical illness, stress, and effects on plant and animal life, air quality and water quality. Geothermal development is an ugly result of political maneuvering and power.

Steve and Diane Davis

Believe their serious health problems result from geothermal well venting and the June 1991 blowout. Project should not be located near a residential area. The industry should not be allowed to police itself.

John M. Davis

Supports geothermal development but acknowledges "reasonable concerns about air quality, health hazards, construction standards, etc."

Denise Fleming et al.

Sent a letter/petition of support for geothermal development efforts.

Ole Fulks

Feels local air quality and the groundwater have been adversely affected by geothermal development activities. His letter also includes an article from the *Hawaii Tribune-Herald* (Oct. 15, 1989) entitled "Story of Hawaii's Public and Crown Lands" by Russ Apple. The article questions the use of state lands for a project that many Hawaiians oppose for religious and other reasons.

Henry Gluckstern, Attorney and Counselor at Law, Maplewood, New Jersey

Objects to HGP and believes the EIS is a waste of taxpayers' money. Geothermal development will cause environmental destruction. Alternate sources of energy (e.g., conservation and solar) should be explored.

Maja B. Gossom

Concerned about the destruction of the rainforest and would like to see wind and solar technologies further developed instead of geothermal. Area is too geologically active. An expensive backup system will be needed if geothermal facilities are inoperative. Conservation is a viable option. Geothermal has not been proved to be a "renewable."

Steven Krawn (sp.?)

Objects to further geothermal development. Believes well venting has seriously affected his health. Also feels his

wife's illness and the death of his pets are a result of geothermal well ventings. Afraid to drink from catchment water system.

Francois L'Orange et al., realtors.

Believe geothermal development "has effectively destroyed and abrogated the neighboring resident's property rights." The project also violates the right to clean air and water. They are also concerned about the effect of reinjection on the area groundwater.

Stephen Lewis

Feels his health problems were caused by living near the existing geothermal well.

Dan and Lydia Makuakane et al.

Sent a letter/petition of support for geothermal development efforts.

Frank A. McHale, Manager, Advanced Projects, Hawaiian Dredging & Construction Co.

Wants to note that coal use is increasing in Hawaiian power generation, "adding a new dimension to Hawaii's alternative energy needs." [He also asks that his letter be considered as a private communication, not for publication.]

Mildred Mims

Has questions about geothermal development: Why destroy a rainforest? What about noise pollution? How safe are the emitted gases? Why locate the wells in a subdivision?

Peter R. Ministero

Left home because of June 1991 blowout. Believes family illnesses have been caused by well venting. Land value has gone down. Noise is a problem.

Bettie Van Overbeke

Feels H₂S aggravates her asthma. Is concerned about effects of emissions on water catchment system.

Herbert M. Ritke

Opposed to geothermal development. Believes that emissions from experimental well caused his respiratory system distress. Noise of drilling more wells was intrusive. Emissions and noise from a geothermal plant will be unacceptable near residences. State Department of Health does only minimal, ineffectual monitoring. Mr. Ritke also asks to be contacted if Dr. Lewis or staff are in the area (808 965-8992).

Joseph Shaver (sp.?)

Believes the location of the project is wrong. Existing well has released toxic substances, causing health problems for nearby residents and polluting the subdivision's catchment water supply system. Blowouts, ventings, and equipment failures are a problem. Potential earthquakes are also a problem. Solar and other renewables and conservation are better choices for energy production.

Stephanie Shelofsky

Says H₂S will damage mucous membranes. Existing discharges have made animals sick

and have caused mutations in fruit. Solar and wind are alternatives.

Dian Smith.

Feels the geothermal sites should be placed away from residences, with at least a 10-mile buffer zone, in order to be safe. The project has a history of mechanical failures, blowouts, and human errors.

Mr. and Mrs. Arlan Vierra

Feel that geothermal development will destroy habitat, allow foreign flora to invade, and pollute air and water. Would like to see alternative energy sources and conservation pursued.

David L. Wegner, Program Manager, Glen Canyon Environmental Studies, Bureau of Reclamation, Upper Colorado Region (U.S. Department of the Interior)

Asks to be put on mailing list for all technical DOE documents related to HGP because of similarities between HGP and DOI's Colorado River activities.

ATTACHMENT 1

List of Environmental Issues Submitted by Office of State Planning, State of Hawaii, in Response to HGP EIS Advance Notice of Intent

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 wellfields. 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.

Air Quality. The EIS should also discuss the effects of well venting, accidents, smell of hydrogen sulfide and other gases, and acid rain effects on ecological resources and water catchment and supply systems (i.e., lead leaching from roofs and plumbing). Although the volcano produces hydrogen sulfide and causes acid rain effects, hydrogen sulfide 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 what areas and communities are likely to be impacted. People may be able to detect hydrogen sulfide levels below instrument detection.

Water Resources. The EIS should evaluate the effects of hydrogen sulfide 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 water source which can be affected. 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, 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.

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. Also, a discussion of the impacts the project may have on the native Hawaiian religion should be included. The EIS should also include a cost/benefit study which analyzes the likelihood of disruption or destruction of facilities by volcanic activity.

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.

A comprehensive review of the Phase 4 impacts at all of the possible sites should be included in the EIS. In addition, a thorough evaluation of all other available alternative energy technologies and their feasibilities should be done, including consideration of an aggressive conservation program.

ATTACHMENT 2

Outline of Concerns Submitted by Steven Moser, M.D., in Response to HGP EIS Advance Notice of Intent

A. Environmental Degradation

1. Air Pollution

a. Hydrogen sulfide

1. effects on human health, review of published literature
2. nuisance effects, with complete review of prolonged olfactory nuisance
3. effects on vegetation (crops, rainforest)
4. acid rain
5. effects of reinjection on the aquifer
6. effects on ambient air quality
7. comparison of Hawaii standards and those of California and other jurisdictions
8. history of noncompliance to standards by geothermal developers

b. Boron

1. effects on flora
 2. bioaccumulation potential
 - c. Benzene
 1. risk assessment
 - d. Mercury
 1. risk assessment
 - e. Selenium
 1. risk assessment
 2. health effects
 2. Water Pollution
 - a. Calculation of cumulative amounts of geothermal effluents
 - b. Calculation of the projected amounts of heavy metals and radioactive elements
 - c. Alternatives for geothermal effluent disposal
 1. methods
 - surface impoundment
 - deep reinjection (to geothermal resource)
 - shallow reinjection (to aquifer)
 - runoff to surrounding environment
 - marine disposal
 2. relative advantages and disadvantages
 - uniqueness of Hawaii geologic formations
 - degree of contamination each would pose
 - aquifer/groundwater contamination
 - potential for marine contamination
 - effects on the geothermal resource
 - loss of longevity of the resource
 - d. Potential health effects of heavy metal contamination of drinking water resources
 1. risk assessment for each chemical
 - e. Potential health effects of heavy metal contamination of marine environment
 1. bioaccumulation in food chain
 2. risk assessment
 3. worst case scenario
- B. Accidents
 1. Drilling
 - a. Blowouts, upsets, explosions
 1. single
 - health effects of massive H₂S release
 - bodily injuries, death of workers
 - environmental damage
 - damage to surrounding forest
 - effluent effects on riparian environment
 - acoustic effects of extreme noise
 - psychological effects: acute, chronic
 - adequacy of disaster plans (history of poor compliance)
 2. multiple
 - conditions conducive
 - earthquake
 - transmission cable disruption with need to open vent well field
 - sabotage (ecotage)
 3. mitigatory efforts
 4. adequacy of control technologies - review of prior accidents
 2. Operations: same as "Drilling"
 3. Cable disruption
 - a. Effects on marine environment
 - b. Effects on surrounding vegetation
 - c. Effects on wellfield

- d. Effects on electric grid (recipients)
- C. Effects of Geothermal Development on Puna Rainforest
 - 1. Scope of project
 - a. Megawatts projected
 - b. Average life of each well, plant
 - c. Plan of development of entire geothermal project as a long-term source of power - extent of incursion into the rainforest
 - d. Effect on rainforest of segmentation by roads, powerlines, etc.
 - 2. Catalog of native species
 - a. Native Hawaiian species
 - b. Endemic species
 - c. Introduced species
 - d. Medicinal species
 - 1. effects on native healers of loss of medicinal plants
 - 2. loss of biological diversity
 - 3. loss of pharmacological research potential
 - 3. Effects on native Hawaiians
 - a. Loss of medicinal herbs
 - b. Loss of ceremonial plants and plant products
 - c. Loss of spiritual connection with land: psychological displacement and despair, loss of cultural identity, alienation
- D. Electrical Transmission
 - 1. Health effects on human populations
 - a. Literature search on the health effects of VLF exposure (60 Hz)
 - b. Specific effects on Hawaiian populations (higher cancer rates among Hawaiians) with regard to specific route of the cable
 - c. Risk assessment for various groups
 - 2. Effects of electromagnetic fields on marine life
 - a. Direct physiological effects on marine life
 - b. Effects on cetaceans migratory patterns - literature search
 - c. Attraction of pelagic sharks
- E. Nuisance effects
 - 1. Noise
 - a. Noise as a chronic stressor in human populations - literature search and recent position of EPA
 - b. Auditory damage during upset conditions
 - c. Special atmospheric conditions enhancing noise propagation in Puna area
 - 2. Hydrogen sulfide
 - a. Stressor effects of chronic exposure to minor irritant effects of H₂S - literature search
 - b. Stress of anxiety related to potential for severe morbidity and/or mortality resulting from high levels of H₂S in upset conditions
 - c. Anger and frustration with inability to change situation
 - 3. Psychological stress from loss of aesthetic ambience due to geothermal development in rainforest
 - 4. Loss of spiritual connection with land (see above)
 - 5. Combination of 1-4