hgpapipe

REVIEW OF THE HGP-A/THERMAL POWER PIPELINE PROJECT

(QUESTIONS AND ANSWERS)

- 1. WHAT IS THE ACTUAL DURATION OF THE LONG TERM FLOW TEST? THE POP STATES 4 YEARS, HOWEVER, HOW CAN THIS BE WHEN THE 12.5 MW POWER PLANT IS SCHEDULED FOR COMPLETION AND OPERATION BY 1989.
- A. THE 4 YEARS IS REQUIRED TO TEST FOR ANY DECLINE IN PRODUCTION OVER TIME AND TO AMORTIZE THE COST OF THE PIPELINE OVER 4 YRS. PER PATTERSON, THE NELH/PGV AGREEMENT PROVIDES FOR A PAYMENT OF \$17,000/MONTH TO THERMAL TO PAY FOR THE COST OF THE PIPELINE, AND ANOTHER \$4,000/MO. GOING TO THE RESEARCH CENTER. ANY EXCESS WILL GO TO A FUND FOR MAJOR OVERHAULS AND/OR OTHER RESEARCH.

THERMAL PROPOSES TO DRILL 3 MORE WELLS BEFORE CONSTRUCTION OF THE POWER PLANT AND IF ALL ARE SUCCESSFUL, THIS WOULD ALLOW THEM TO CONTINUE TO USE KS-1A TO SUPPLY STEAM TO HGP-A.

- 2. PGV NEEDS TO SUBMIT A 1:24,000 SCALE MAP SHOWING THE PIPELINE ROUTING, INCLUDING THE PROPOSED EXTENSION TO KS-2.
- 3. WHAT IS PLANNED IF THE BRINE PIPELINE BECOMES PLUGGED DUE TO SILICA PRECIPITATION? IS A" BACKUP" BRINE DISPOSAL SYSTEM BEING PROPOSED?
- 4. WHO WILL TAKE OVER THE MAINTENANCE OF NOISE AND H2S MONITORING STATIONS SURROUNDING HGP-A? CURRENTLY, THERMAL ONLY TAKES CARE OF THE WOODS RESIDENCE STATION AND ONE ON THEIR PROJECT SITE.
- A. PER PATTERSON, MAINTENANCE OF THE MONITOR STATIONS IS DISCUSSED IN THE AGREEMENT BETWEEN NELH AND PGV.
- 5. MORE INFO IS NEEDED RE: THE PROPOSED GAS AND LIQUID RE-INJECTION TESTS BEING PLANNED AT THE HGP-A FACILITY. IS HGP-A BEING PROPOSED FOR USE AS AN INJECTION WELL , OR WILL LANIPUNA & BE USED, OR WILL INJECTION WELLS BE DRILLED? PER PATTERSON, KS-2 MAY ALSO BE USED FOR INJECTION TESTS.
- IF INJECTION IS BEING PLANNED, WHERE ARE THE MONITOR WELLS PROPOSED IN THE EARLIER POP GOING TO BE LOCATED?

WHAT ARE THE FUTURE PLANS FOR THE HGP-A WELL? IS THE WELL GOING TO BE RECONDITIONED? SHOULD DLNR REQUIRE NELH TO FILE A AMENDED POP EVEN IF THEY NEVER FILED AN ORIGINAL POP?

- 6. DOES THE RECOMPLETION PLANS FOR KS-2 INCLUDE RECASING OF THE WELL?
- A. PER PATTERSON, CURRENT PLANS ARE TO DIRECTIONALLY DRILL AND RECASE WELL KS-2.
- 7. MORE INFO NEEDED RE: THE PROPOSED INJECTION EXPERIMENT INTO KS-2? WHY WAS THE 1,500 TO 2,000 FOOT INTERVAL CHOSEN? WILL THE EXISTING CEMENT PLUG BE DRILLED OUT FIRST? WILL PACKERS BE USED BELOW THE DAMAGED SECTION OF TH 9 5/8" CASING? RESULTS FROM THE PERMEABLILTY INJECTION TESTS SHOULD BE SUBMITTED TO DLNR.
- 8. PGV NEEDS TO SUBMIT AS BUILT DRAWINGS FOR ALL THE COMPLETED WELLS AND ALL CEMENT BOND LOGS.

RE: THE CSMAT SURVEY, THE CATHOLIC CHURCH LAND WILL BE USED AS THE SITE OF THE TRANSMITTER STATION.

NEED TO DECIDE WHETHER THE AMENDED POP WILL REQUIRE BOARD APPROVAL OR JUST CHAIRPERSON'S APPROVAL.

PROPOSED ADJUSTMENTS TO THE UIC LINE IS NOW BEING DISCUSSED IN BILL SEWAKE'S DWS OFFICE.

Diemer 6 File#24

### DAILY REPORT

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Submitted by Line Call

#### DAILY REPORT

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Submitted by La Coul

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Submitted by \_\_\_\_\_\_ Gall

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Submitted by Lin Oul

April 25, 1987

**MEMORANDUM** 

TO:

Mr. Mike Shimabukuro, Land Management Division

FROM:

Manabu Tagomori

SUBJECT:

Second Amendment Plan of Operations Geothermal Mining Lease R-2, Hawaii

In response to your memorandum of March 4, 1987, attached for your consideration is our final draft of a letter to Mr. Ralph Patterson for Mr. Paty's signature.

MANABU TAGOMORI

DL:dh

Mr. Ralph A. Patterson, Jr. Hawaii Project Manager Thermal Power Company 220 South King Street, Suite 1750 Honolulu, Hawaii 96813

Dear Mr. Patterson:

#### Second Amendment Plan of Operations Geothermal Mining Lease R-2, Hawaii

Your second amendment to the Plan of Operations covered by State Geothermal Resource Mining Lease R-2, has been reviewed in accordance with the Department's Administrative Rules, Title 13, Chapter 183.

You are hereby granted approval of your proposed amendments to the Plan of Operations subject to all applicable statutes, ordinances, rules and regulations of the Federal, State and County governments, and the following conditions:

- (1) The applicant shall submit a detailed map showing the pipeline (10-inch steam and 3-inch brine) route from Well KS-1A to the HGP-A plant, including the proposed extension of the pipelines to Well KS-2.
- (2) The applicant shall notify the Department of any changes to the maintenance and operation of the existing air and noise monitoring program.
- (3) The applicant shall submit an as-built drawing of Well KS-2 and shall file with the Chairperson, an appropriate application for permission to modify the KS-2 well.
- (4) The applicant shall submit in a timely manner, all reports pertaining to the maintenance and operation of the plan and to revenues received by the HGP-A facility.
- (5) Prior to conducting any experimental well injection tests of geothermal fluids or gases, the applicant shall submit a subsequent amendment to the Plan of Operations to the Department for approval.

- (6) The duration of the amended operations shall not exceed four (4) years from the date of approval.
- (7) All activities on the leased lands covered by State Geothermal Resource Mining Lease S-4602 shall be subject to the approval of the lessee.

Very truly yours,

WILLIAM W. PATY Chairperson of the Board

cc: Board Members
Mr. Mike Shimabukuro
County of Hawaii Planning Dept.



A 9 :

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF LAND MANAGEMENT
P. O. BOX 621

HONOLULU, HAWAII 96809

MAR 0 4 1987

DIVISIONS:
AQUACULTURE DEVELOPMENT
PROGRAM
AQUATIC RESOURCES
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

#### **MEMORANDUM**

TO:

Division of Water and Land Development

FROM:

Mike K. Shimabukuro, Division of Land Management

SUBJECT:

Second Amendment to the Plan of Operation for Puna Geothermal Venture, DLNR Administrative Rules, Title 13, Chapter 183-56, G.M. Lease R-2.

Land Management Division has received a request for approval to a second amendment to the Plan of Operation (copy enclosed) for the Puna Geothermal Venture, for which Thermal Power Company is the operator, in accordance to Administrative Rule, Title 13, Chapter 183-56 (Amendment to Plan Operation).

We would appreciate your review and response to Thermal Power Company of this second amendment to Plan of Operation as it pertains to your area of concern. Your continued cooperation is much appreciated,

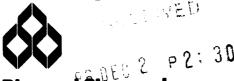
MIKE K. SHIMABUKURO

Attachment

cc: Hawaii Board Member

Hawaii District Land Office

r 5



**Diamond Stiamrock** Thermal Power Company Raiph A. Patterson, Jr. Hawaii Project Manager

SYATE OF HAWAH
2 December 1986

DEC 5 10 ON 14.86

Mr. Susumu Ono Chairman Board of Land and Natural Resources Kalanimoku Building 1151 Punchbowl St. Honolulu, HI 96813

Dear Mr. Ono:

In accordance with the Department of Land and Natural Resources Administrative Rules, Title 13, Chapter 183-56, the approval of the enclosed second amendment to the Plan of Operation for the Puna Geothermal Venture, for which Thermal Power Company is the operator, is hereby requested.

The Plan of Operation covers the exploratory activities taking place on the lands covered by State Geothermal Mining Lease R-2.

If there are any questions, please direct them to me at the Honolulu office of Thermal Power Company.

Sincerely yours,

RAP/cn encl ONOPOPLT PUNA GEOTHERMAL VENTURE
Thermal Power Company, Operator

1 December 1986

#### AMENDMENT TO PLAN OF OPERATIONS

### Geothermal Resource Mining Lease No. R-2 Puna District, Hawaii County, Hawaii

This Second Amendment supplements the existing Plan of Operation which was first approved by the Board of Land and Natural Resources (BLNR), State of Hawaii on March 13, 1981 and approved as amended on January 23, 1985. This Second Amendment is submitted for approval under Section 13-183-56, Administrative Rules of the Department of Land and Natural Resources.

Three exploratory geothermal wells, drilled and completed on Lease No. R-2 by Thermal Power Company, Operator for Puna Geothermal Venture (PGV), are described below:

<u>Well</u>	Completion Date	Total Depth	Summary a	nd Status	
Kapoho State 1	11-12-81	7920'	Tested Suspended plugs.	geothermal with	fluids. drillable
Kapoho State 2	4-02-82	8005 <b>'</b>	Tested Suspended plugs.	geothermal with	fluids. drillable
Kapoho State 1A	9-03-85	6505 <b>'</b>	Tested Shut in.	geothermal Flowable.	fluids.

Well Kapoho State 1A (KS-1A) included substantial advances in steel casing design, cementing, completion procedures and flow testing. All of these were essential inputs to more effectively contain and control a hot and vigorous geothermal resource. Well KS 1-A, over 17 days of continuous flowing in October 1985 at wellhead pressure and temperature of 155 psig and 370°F

respectively, yielded a steadily increasing total mass flow with final measurements of 65,000 pounds per hour steam and 14,000 pounds per hour of brine. The produced 18% brine fraction displayed a salinity of 35,000 milligrams per liter and pH of 5.45. The non-condensible gas fraction, at only 0.15% by weight of the total mass produced, was charged with an H<sub>2</sub>S concentration of about 1200 parts per million.

#### PROPOSED OPERATIONS UNDER THIS SECOND AMENDMENT.

All previously approved Plans of Operations remain valid, and are supplemented by this amendment. Three distinctive operations would be accomplished, following approval of this amendment:

- 1. Initiate and maintain a long term flow test of Well KS 1-A by pipeline delivery of geothermal steam to the HGP-A 3 MW turbine generator plant and of geothermal brine liquids to Puna Research Facility. The duration of this flow test may approximate four years under an agreement with RCUH. This program was further described in our proposal forwarded by RCUH/Thermal Power Co. letter dated May 29, 1986.
- 2. Redrill and recomplete Well KS-2 in the geothermal reservoir and flow test its new productive capacity.
- 3. Conduct ground surface geophysical surveys to improve the understanding of the productive geothermal reservoir by correlation with existing successful and unsuccessful geothermal wells.

#### Long Term Flow Test

Information obtained from the proposed long term flow test from Well KS-lA would provide a most successful conclusion to the exploration objectives of the existing Plan of Operations. It should confirm the existing opinion of the Operator that Lease No. R-2 can support an economic and long lived utilization of the resources discovered for geothermal electric power supply. Delivery of steam and brine by pipeline to the 3 MW plant, under Agreement between TPC and RCUH, will provide an increased steam quantity for possible increased electrical generation levels. The test would also allow shut-in and evaluation of the conditions of the HGP-A wellbore, wellhead and control gate valves after 5 years of service in a continuous flow mode.

The pipeline between Well KS-lA and the HGP-A plant would consist of 2 separate fluid lines, mounted together on columnar supports. An approximate 2500-foot long pipeline route would be sited in a 30-foot wide right of way including a vehicular service trail. The proposed pipeline route was selected to minimize impacts on existing land surface use and to reduce visual sighting from lands adjoining Lease No. R-2. The nearly level pipeline route crosses a gentle topographic depression which will largely hide the pipeline from public roads and the HGP-A Visitors Center. The proposed pipeline route has been surveyed and is illustrated in the Operations Map attached to this Second Amendment.

Well KS-lA effluent would be separated at the well head into steam and brine fractions. The steam would be conveyed in a nominal 10" diameter steel pipeline, schedule 40, 0.365" wall thickness, insulated and painted with a subdued color. Pipeline steam flow rate will approximate 55,000 pounds per hour at pressure ranging from 215 to 175 psig. Brine would be conveyed in one 3" diameter steel pipelines, schedule 80, 0.3" wall thickness, similarly insulated and painted. Pipeline brine flow rate will approximate 17,000 pounds per hour at comparable pressures. TPC has designed the pipeline system to comply with ANSI/ASME B 31.1 1986.

PGV would fund 100% of the cost of the pipeline, post a construction bond of equal amount under DLNR rules, construct and test the line in conformance with applicable codes in early 1987. The long term flow test would commence immediately following completion of pipeline testing and certification.

TPC would assume operation and maintenance of the HGP-A plant under contract to RCUH, during the flow test. This would allow an optimal integration of well, pipeline, plant, abatement and disposal functions. Coordinated programs of measurement and recordation, especially of well effluent, plant performance, system emissions and residual fluid parameters, would establish an invaluable new data base to guide an informed development and broadest utilization of the Puna geothermal resources. PGV will assist and coordinate with an NELH determination of the current state and future effective utilization of the HGP-A well.

TPC will convey all Well KS-lA brine to the Puna Research Facility for use in the Community Geothermal Technology Demonstration Program. Additional tests and research to be performed at the facility will focus on the injection requirements of geothermal fluids to minimize air emissions and surface disposal of fluids which have characterized the HGP-A Project to date.

#### Well KS-2 Redrilling and Recompletion

Following technical evaluations now in progress PGV expects to apply for a DLNR permit to redrill and recomplete Well KS-2 in the geothermal reservoir. The planning for this operation includes evaluation of a short term fluid injection experiment into the 1500 to 2000 foot depth interval of the KS-2 wellbore. This experiment, if pursued, would not adversely impact the recompletion potential of Well KS-2; however, the injection experiment must precede the redrilling. The specific injection procedures selected would be submitted to DLNR for approval before initiating such activity.

On successful completion of the redrill, an appropriate flow test would evaluate the well's new productive capacity. PGV would view this new steam supply as backup for the HGP-A 3 MW plant during the life of the long term flow test. If required, the pipeline for Well KS-2 would be an extension of the pipeline proposed for the long term flow test.

Geophysical Surveys

TPC is planning to conduct ground surface geophysical surveys to confirm and

extend the results of well drilling to date. Consideration is being given to

a Controlled Source Audio Magneto-Telluric (CSAMT) procedure which safely

imposes a strong electric current (30 amps, 800 volts) into the ground from a

trailer-mounted generator at a fixed, isolated location. Sensitive, low level

voltage readings are taken at each measurement site by two person teams.

ten persons, including geophysicists, technicians and a TPC supervisor would

accomplish the preferred grid of 100 measurement sites in daylight hours over

a four week field schedule. If CSAMT proves technically effective, it should

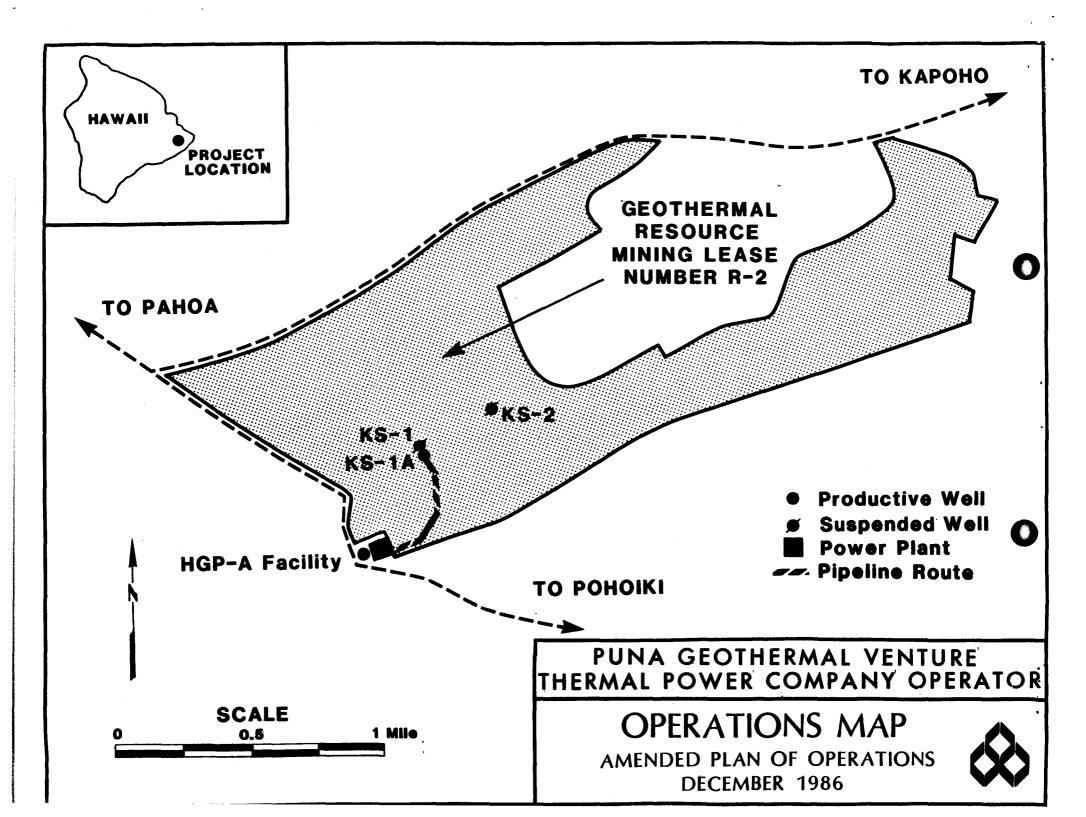
correlate with all existing geothermal wells (6) and so guide future drilling

to higher well productivity with reduced dry hole risks.

WLD/ma WLD0100

Attachment: Operations Map

- 6 -





#### Diamond Shamrock

Thermal Power Company

Ralph A. Patterson, Jr. Hawaii Project Manager

17 March 1987

Mr. Manabu Tagomori
Department of Land and
Natural Resources
Kalanimoku Bldg. Rm. 227
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Manabu:

Although your schedule and mine haven't "meshed" in the last few weeks, I did run into Dan Lum between legislative hearings last week. We had the opportunity to discuss three items that we have on our near-term schedule that have a relationship to DLNR or the Land Board. These aré:

#### 1. Project EIS

After a series of discussions, Thermal Power Company proposed, and the County Planning Department agreed, to be the accepting agency for an EIS covering our proposed 25 MW development in Puna. The Notice of Preparation was published in the OEQC <u>Bulletin</u> on February 23rd.

We recognize that DLNR has a strong interest in project and that the Department's environmental obligations as specified in Title 13, Chapter 183 must be met before the Plan of Operations can be approved. We had hoped it would be possible to meet with you to discuss the processing of the EIS before drafting and mailing "request for comment" letters parties. Because of your busy interested schedule, this has not been possible. Hence, we are now in the process of drafting and mailing the requests for comments.

Thermal Power Company, A subsidiary of Diamond Shamrock Central Pacific Plaza, 220 South King Street, Suite 1750, Honolulu, Hawaii 96813 Phone: 808 524-8940 Mr. Manabu Tagomori 17 March 1987 Page Two

We hope to schedule three public meetings towards the end of this month, two on the Big Island and one in Honolulu, to discuss the project. One of the topics we would like to cover is the processing procedures being followed, and I consider it important that we meet with you and/or your staff prior to those meetings.

#### 2. Plan of Operations Amendment

The second matter Dan and I covered concerns our plan for the pipeline and test operations in conjunction with the agreement we made with RCUH on the HGP-A project. In December, we submitted an amendment to our existing Plan of Operations which covers the pipeline and test of the KS-lA well as well as some other plans for our project; this submission was acknowledged by Chairman Paty in a letter dated February 5th.

As part of our planning and construction scheduling we need to know the status of your review of our amendment application.

#### 3. Royalty Waiver

The last item I discussed with Dan concerned the draft of a letter outlining our preferred approach to a royalty waiver for the HGP-A operations by amending the terms of the R-2 lease. If this approach is not acceptable, we should discuss how Thermal should submit a formal request for the waiver, as Chairman Paty recommended in his letter of February 5th.

Manabu, I am aware of the demands on your time created by the water bill and other legislation. If it is possible I would appreciate it if you could squeeze me into your schedule sometime this week or next. A brief meeting where we can catch-up on the above three items would be fine. My secretary will contact your office to see if such a meeting can be scheduled.

Sincerely yours,

RAP/cn TAGOMLTR

cc: Mr. Dan Lum

## WATEP RESOURCES & FLOOD CONTROL BRANCH ision of Water and Land Developent

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Thermal Power Company

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Raiph A. Patterson, Jr. Hawaii Project Manager

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17 February 1987

Mr. Dan Lum Pept. of Land & Nat. Resources 1151 Punchbowl Street Honolulu, Hawaii 96813

Dear Dan:

I have enclosed some background notes and justification relating to our royalty waiver approach. I spoke briefly with Johnson Wong about our reasoning on Friday, and he seemed to agree with the concept.

I will be in California this week, but will call you when I return. You can reach me through my Honolulu office if need be.

Sincerely yours,

encl RAP/cn LUMLTR

#### Re: Waiver of Geothermal Royalties, Lease R-2

in reference to our discussions is correspondence with Thermal Power Company ("TPC") regarding of royalties to the State in connection with an agreement between TPC and the Research Corporation of the University of Hawaii ("RCUH"). Under the terms of TPC is to operate the HGP-A plant, which agreement, presently operated by Hawaii Electric Light Company ("HELCO"). In addition, TPC will provide the HGP-A plant with steam and brine from TPC's KS-1A well through a pipeline to constructed by TPC and Puna Geothermal Venture ("PGV").

RCUH's Mining Lease S-4602 provides for the waiver of any royalties on geothermal resources produced from its leased land. The mining lease relating to TPC's KS-lA well, Mining Lease R-2, provides for a payment of a royalty of 10% of the gross proceeds from the sale or use of geothermal resources produced from the leased land.

In light of the indications that royalties are required under the the terms of Mining Lease R-2, TPC would like to seek a waiver of such royalties, since under the TPC-RCUH agreement, the payment of any royalties will be made from revenues received by RCUH for electricity sales.

TPC believes that there are two methods by which such a waiver can be obtained: 1) application for a formal waiver as provided for in the recently enacted \$182-18, H.R.S.; or 2) amendment of Mining Lease R-2 to provide for a waiver of royalties with respect to any geothermal resources produced from the KS-1A well and transported to or used at the HGP-A plant. For reasons which are discussed more fully below, TPC believes that the second alternative is preferable.

Section 182-18, H.R.S., enacted in 1985, gives the Board of Land and Natural Resources ("Land Board") authority to waive royalty payments in order to encourage the commercial production of geothermal resources. Section 182-18(b), H.R.S. further provides that the Land Board shall adopt rules, pursuant to Chapter 91, H.R.S., to establish the basis upon which such waivers will be granted. The Land Board has not yet adopted any rules governing royalty waivers.

It therefore appears that the Land Board will not be able to grant any royalty waiver to TPC pursuant to §182-18, H.R.S. until it has first adopted rules governing such waivers. TPC might therefore not be able to obtain such a waiver for a substantial period of time.

Page Two 2/17/87

TPC had plans to begin construction of the pipeline connecting the KS-lA well and the HGP-A plant by April, 1987. In order to avoid a substantial delay in its plans, TPC would prefer to amend Mining Lease R-2 to provide that the payment of royalties will be waived with respect to any geothermal resource land that is transported to or used at the HGP-A plant. Such an amendment would be consistent with both the terms of the HGP-A Mining Lease, and intent of \$182-18, H.R.S.

The waiver of royalty payments under Mining Lease S-4602 was in recognition of the State's interest in developing alternate energy sources, and investigating the feasibility of the production of geothermal resources. This intent is reflected in the lease, which provides:

WHEREAS, The Lessor is concerned with the development of alternate energy sources for the State of Hawaii; and

WHEREAS, the Lessor owns certain lands that have geothermal resources thereunder and is desirous of investigating the economic feasibility of the production of such resource; and

\* \* \*

WHEREAS, Lessor is desirous of leasing certain lands to lessee for the development, operation, utilization and research of geothermal resources;

The stated purposes of Mining Lease S-4602 include "conducting flow tests to provide more information about the characteristics of the geothermal well identified as HGP-A and geothermal reservoir under the leased land." The Lease also contemplates that such research is not strictly limited to the leased land:

Lessee may at its own option either drill on the leased land or obtain rights on other adjoining or adjacent lands in the vicinity of said leased land for drill sites from which wells can be slant drilled into said leased land for the purpose of the exercise of all other rights and privileges hereinabove granted to Lessee under this Lease.

From the foregoing, it is apparent that Lease S-4602 was granted to enable RCUH to conduct research and investigation of the feasibility of the development and production of geothermal resources located on both the leased land and land in that vicinity. In order to further this purpose, payment of royalties was waived.

Page Three 2/17/87

Section 182-18, H.R.S. reflects an extension of the intent of Mining Lease S-4602. Section 182-18 provides:

(a). . . With respect of all geothermal mining leases previously issued or to be issued, where the board determines that it is necessary to encourage the initial or continued production of geothermal resources, the board shall have the authority to waive royalty payments to the State for any fixed period of time up to but not exceeding eight years.

One purpose of the agreement between TPC and RCUH is to further encourage geothermal research by conducting a long-term flow test of the KS-lA well. Any request for an amendment to Mining Lease R-2 granting a royalty waiver would relate solely to the use of geothermal resources in connection with the HGP-A plant. In light of the purposes of the TPC-RCUH agreement, the royalty waiver contained in the RCUH lease, and the intent of \$182-18, H.R.S., TPC believes that a waiver of royalties is appropriate.

TPC further believes that an amendment of the R-2 lease would best accomplish this purpose. This is primarily due to the substantial delay which would result if TPC were required to seek a waiver pursuant to §182-18, H.R.S., as discussed above. In addition, TPC believes that its circumstances are rather unique in that the HGP-A plant is already operating under a waiver contained in its own Mining Lease.

If this proposal is acceptable to the DLNR, we would like to begin proceedings for amendment of the lease as soon as possible.

### WATER RESOURCES & FLOOD CONTROL BRANCH ision of Water and Land Development

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K. Oshiro	FOR YOUR:	
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#### **Diamond Shamrock**

Thermal Power Company

Ralph A. Patterson, Jr. Hawaii Project Manager

17 February 1987

Mr. Manabu Tagomori
Dept. of Land & Nat. Resources
Division of Water & Land Dev.
Kalanimoku Bldg. Room 227
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Tagomori:

Per the request passed by Dan Lum, I have enclosed a copy of the completed agreement between Thermal Power and RCUH regarding the operation and maintenance of the HGP-A plant, including the pipeline from the KS-lA well.

In accordance with Article X.e. of the agreement, the NELH Board approved the agreement at its meeting on 12 February, 1987.

We will be glad to review the agreement, and its relationship to all of our geothermal activities, at your convenience. Please call me if there are any questions.

Sincerely yours

encl RAP/cn TAGOMLTR

#### SERVICE AGREEMENT

THIS AGREEMENT is executed this 5th day of January 1987, by and between THE RESEARCH CORPORATION OF THE UNIVERSITY OF HAWAII, a body corporate constituting a public instrumentality under the laws of the State of Hawaii (hereinafter called "RCUH"), and THERMAL POWER COMPANY ("TPC"), a California corporation.

WHEREAS, RCUH, acting as the Manager and agent for the Natural Energy Laboratory of Hawaii ("NELH"), has agreed with NELH to operate, maintain and test the HGP-A plant, a geothermal research plant located on the Island of Hawaii; and

WHEREAS, RCUH desires TPC to operate and maintain the HGP-A plant and related facilities as shown on Exhibit A, "Site Plan," attached hereto, including the power plant, Visitor Center, cooling water system, hydrogen sulfide abatement system, switching station, settling ponds and effluent disposal system but excluding the Puna Research Center and the HGP-A well, as described on Exhibit A (the "HGP-A plant"); and

WHEREAS, TPC is the owner and operator of various wells together with Amfac Energy, Inc. ("Amfac") under that certain Joint Operating Agreement dated July 27, 1981 (the "PGV Agreement"), including the Kapoho State 1-A geothermal well (the "KS-1A well") which has been drilled on land adjacent to the HGP-A plant; and

WHEREAS, TPC and Amfac desire to conduct a long-term flow test of the KS-lA well pursuant to the terms of the PGV Agreement; and

WHEREAS, TPC as operator under the PGV Agreement has proposed to build a pipeline system for the delivery of PGV steam to the HGP-A plant in furtherance of the test; and

WHEREAS, TPC as operator under the PGV Agreement has proposed to separate brine from the steam produced from the KS-lA well and to deliver such brine to the Puna Research Center, a research facility adjacent to the HGP-A plant shown on Exhibit A attached hereto; and

WHEREAS, TPC as operator under the PGV Agreement has proposed to operate and maintain the HGP-A plant subject to the terms of this Agreement;

NOW, THEREFORE, in consideration of the premises and the respective promises contained herein, the parties hereto mutually agree as follows:

#### ARTICLE I. STEAM SUPPLY

1.01 Upon execution of this Agreement and satisfaction of the conditions set forth in Article X below, TPC will proceed to cause the necessary steam pipeline system ("steam supply facilities") to be installed and constructed for the transportation of steam from the outlet valve for steam at the KS-lA well to the steam delivery point, as hereinafter defined, at the HGP-A

plant. In addition to the steam supply facilities, TPC will proceed to cause mechanical separators, pipelines and related equipment ("brine supply facilities") to be installed and constructed to separate the brine from the steam produced from the KS-lA well and to transport said brine from the outlet valve for brine at the KS-lA well to the brine delivery point, as hereinafter defined, at the Puna Research Center. The steam supply facilities and brine supply facilities are shown on Exhibit B.

- 1.02 The steam supply facilities and the brine supply facilities shall be installed and constructed at TPC's expense and shall be owned by TPC in accordance with the terms of the PGV Agreement. TPC shall operate the KS-lA well, the steam supply facilities and the brine supply facilities under the terms of the PGV Agreement and RCUH shall have no interest therein.
- 1.03 TPC as operator under the PGV Agreement shall use its best efforts to deliver all the steam and brine produced from the KS-lA well to the respective delivery points for steam and brine except for amounts lost or used in the process of production, processing and transportation. Nothing contained herein shall be construed as a guarantee that the

- KS-1A well will be capable of producing the quantity or quality of steam necessary and appropriate to operate the HGP-A plant or that TPC can deliver a particular quantity of steam to the HGP-A plant or of brine to the Puna Research Center.
- 1.04 Steam delivered to the HGP-A plant pursuant to this Agreement shall be delivered at one or more points mutually agreed to by TPC and RCUH adjacent to the HGP-A plant (the "steam delivery point"). Brine delivered to the Puna Research Center pursuant to this Agreement shall be delivered at one or more points mutually agreed to by TPC and RCUH adjacent to said Research Center (the "brine delivery point").
- 1.05 TPC will operate the HGP-A plant using the existing settling ponds, pollution abatement equipment and related facilities under existing permits. In the event additional equipment or facilities are required to comply with applicable laws and regulations or if new or additional permit requirements are imposed on the operation of the HGP-A plant, such additional equipment, facilities and permits shall not be the responsibility of TPC except as provided in Section 2.04.

#### ARTICLE II. OPERATION AND MAINTENANCE

- 2.01 TPC shall operate and maintain the HGP-A plant, the supply facilities and steam the brine facilities in accordance with good engineering practices in the electric industry and applicable laws and regulations.
- 2.02 All supplies, maintenance, parts, materials, outside contracted services, taxes, insurance, labor and other costs reasonably incurred in the normal operation of the HGP-A plant, the steam supply facilities and the brine supply facilities will be billed monthly at cost by TPC to RCUH and reimbursed in accordance with Section 3.02, below. Such costs will be determined on the basis TPC payroll, material, and other direct costs, applicable overheads at the time incurred. TPC will provide RCUH an itemization of such costs with each monthly bill furnished under Section 3.02 of this Agreement.
- 2.03 With the prior approval of RCUH, TPC may include in its billing the cost of any scientific, environmental and/or any other equipment and services related to the use, maintenance and operation of the steam supply facilities, the brine supply facilities and the HGP-A plant.

2.04 Notwithstanding the foregoing, and except for the installation of the steam supply facilities and the brine supply facilities under Article I of this Agreement, overhauls, purchases, no repairs, installation or other single project estimated to require expenditures of \$50,000 or more shall be undertaken unless TPC is satisfied, (in its sole discretion, that revenues from the sale of energy from the HGP-A plant during the remaining term of this Agreement will be sufficient to pay the amounts provided for in Section 3.02. If any party proposes such a project such proposal shall be submitted in writing to the other party. If TPC determines that such expenditures will not be repaid, TPC may notify RCUH of its determination which notice shall be given within thirty (30) days from the date of receipt of the proposal, and the parties shall promptly meet and negotiate to determine whether (i) alternative sources for funding the proposal can be obtained, (ii) the proposal can be modified and the cost thereof reduced to a level acceptable to TPC, or (iii) any other alternatives exist to provide for TPC's continued operation of the HGP-A plant under such negotiations are not If this Agreement. successfully concluded within thirty (30) days after

RCUH has received TPC's notice, TPC may elect to terminate this Agreement upon thirty (30) days prior written notice.

#### ARTICLE III. COSTS AND PAYMENTS

- 3.01 All energy produced from the HGP-A plant shall be owned by RCUH and shall be sold by RCUH to HELCO pursuant to the terms of the September 1, 1983 Power Purchase and Service Agreement ("Purchase Agreement") between RCUH and HELCO, as amended.
- 3.02 All revenue from the sale of energy from the HGP-A plant shall be deposited by RCUH in a separate account for the benefit of RCUH and TPC, and shall be applied as follows:
  - (i) To pay all production, severance and other taxes, if any, imposed upon or with respect to the production of steam and the generation of power.
  - (ii) To pay royalties, if any, imposed upon or with respect to steam furnished to the HGP-A plant or brine furnished to the Research Center under this Agreement.
  - (iii) To reimburse TPC for all operating and maintenance expenses incurred under Article II of this Agreement, provided, however, that

operating and maintenance expense incurred with respect to that portion of the steam and brine supply facilities identified as Segment B on Exhibit B hereto shall be reimbursed under this section only up to \$15,000 every twelve months, each twelve month period ending on anniversary of the effective date of Agreement, or pro-rata portion thereof in the terminating year. Expenses reimbursable under this item (iii) shall not include operating and maintenance expense incurred with respect to the KS-lA well and that portion of the steam brine supply facilities identified as and Segment A on Exhibit B hereto.

(iv) To reimburse TPC for all the capital costs of installing the steam supply facilities and the brine supply facilities under Article I of this Agreement at the rate of \$17,000 per month, provided such reimbursements shall not exceed the actual capital costs incurred subsequent to September 1, 1986 for such facilities under Article I of this Agreement. The capital costs to be amortized under this item (iv) shall not include capital costs incurred with respect to the KS-lA well and those portions of the steam and brine supply facilities identified as Segments A and B on Exhibit B hereto.

- (v) To reimburse RCUH for operating and maintenance expenses reasonably incurred in connection with its operation of the Puna Research Center in the amount of \$4,000 per month, provided that thirty (30) days after the anniversary of the effective date of this Agreement, RCUH shall demonstrate to TPC that the operating expenses of the Puna Research Center exceeded \$48,000.00 in the relevant operating year or pro rata portion thereof in the terminating year. RCUH cannot so demonstrate, RCUH shall make reimbursement to the extent that the annual operating expenses for the Puna Research Center less than \$48,000.00 in the relevant operating year, or the appropriate pro rata amount in the terminating year.
- (vi) To reimburse TPC for any and all other claims, costs and expenses incurred with the prior approval of RCUH in connection with this Agreement. The amount of any deductible incurred by TPC in connection with insurance claims hereunder shall be reimbursed under this item (vi).

Monthly payments shall be made from the above referenced account based on bills submitted by TPC

and RCUH, as appropriate, in the order set forth above, within twenty (20) days after receipt of such If the account, including the Reserve, has insufficient funds to fully pay items (i) through (vi) above, then in each case the amount of the shortfall ("Plant Shortfall") shall be paid by TPC and shall be carried forward to the next succeeding month and shall bear interest at the prime rate plus one-half percent (1/2%) (not to exceed the maximum interest costs permitted by applicable usury laws), prime being the rate published from time to time by the Bank of America in San Francisco as its prime funds in the account, including the rate. Ιf Reserve, are insufficient to reimburse RCUH for item (v) above, TPC agrees to pay to RCUH the amount of shortfall (\*Research Center Shortfall\*), provided, however, that money paid by TPC for the Research Center Shortfall shall not be part of the Plant Shortfall. Provided, further, that RCUH shall entitled to receive more funds be through payments by TPC in the form of Research Center Shortfall than RCUH would be entitled to under item above. Amounts contributed to the Research Center Shortfall and the Plant Shortfall by TPC shall be treated as operating and maintenance expenses to be reimbursed to TPC under item (iii) above. If at the termination of this Agreement the aggregate amount of the Research Center Shortfall contributed by TPC, together with interest thereon, has not been fully reimbursed, RCUH agrees to use its best efforts to repay to TPC one-half (1/2) of the unreimbursed amounts from such sources as shall be determined by Upon termination of this Agreement, TPC shall forgive the remaining one-half (1/2) of the aggregate Research Center Shortfall. If at the termination of this Agreement the aggregate amount of the Plant Shortfall contributed by TPC, together with interest thereon, has not been fully reimbursed, TPC shall forgive the unreimbursed Plant Shortfall. Provided, further, that nothing herein shall entitle TPC to reimbursement for amounts in excess of its total costs actually incurred by TPC (plus interest) in connection with the Plant Shortfall and the Research Center Shortfall, however denominated.

3.03 The parties agree to establish a subaccount within the account established under Section 3.02 of this Agreement to provide a reserve (the "Reserve") for future amounts payable under Section 3.02. The Reserve will be funded from any excess account balance after payment of all amounts due pursuant to

Section 3.02 of this Agreement. The amount of the Reserve shall accrue to \$250,000, which amount may be changed from time to time by agreement of the parties. Any surplus amount ("Surplus") remaining after payment of (i) all amounts due pursuant to Section 3.02 and (ii) funding of the current amount of the Reserve will be used to fund geothermal research projects. Each proposal for funding geothermal research from Surplus shall require the prior written approval of all parties to this Agreement, which approval shall cover the specific nature of the research, the scope of the research project and the manner in which funds from Surplus are disbursed.

# ARTICLE IV. INDEMNITY AND INSURANCE

### 4.01 Indemnification.

A. TPC will defend, indemnify and hold harmless RCUH, NELH, The University of Hawaii, the State of Hawaii, and all other entities that in any fashion are a part of the State of Hawaii and any persons employed by them (hereinafter, in this article, collectively and individually referred to as "Indemnitees"), from any and all damage or loss of

every kind whatsoever, including attorneys' fees and costs, that may be caused by or arise out of injury or other harm, including death, that occurs to a person or persons who is either

- 1) employed by TPC, or
- 2) an independent contractor hired by TPC, or any employee thereof.

This duty to defend and indemnify in this Section 4.01A hereof shall arise for any such damage or loss that occurs on the grounds of, or arises out of or is caused by the HGP-A plant, or any thing or condition therein.

This duty to indemnify shall arise for all damage or loss within the scope of this Section 4.01A that occurs during the period of time that TPC operates the HGP-A plant.

The duty to indemnify in this Section 4.01A shall extend to Indemnitees under all circumstances except to the extent that liability arises for negligent or intentional acts or omissions of Indemnitees. The duty to defend arises in all cases within the scope of Section 4.01.

B. In the event of any other damage or loss that occurs during the period of time that TPC operates the HGP-A plant, for injuries of all types that occur on the grounds of, or arise out of or are caused by the HGP-A plant, or any thing or condition therein, to a person or persons not delineated in Subsections 4.01A(1)-(2), inclusive, TPC shall pay all costs reasonably necessary to defend Indemnitees in connection therewith, including attorneys' fees, but shall not indemnify Indemnitees.

This defense right in this Section 4.01B hereof shall extend to Indemnitees under all circumstances except to the extent that liability arises for intentional acts or omissions of Indemnitees.

C. In addition to the agreements set forth in Sections 4.01A and 4.01B hereof, TPC will indemnify and hold Indemnitees harmless for all damage or loss, including attorneys' fees and costs, that may be incurred by Indemnitees by reason of the failure to maintain in full force and effect the insurance set forth in Subsection 4.02(1) hereof.

Indemnity under this Section 4.01C shall be limited in amount to the amount of the policy limit stated in Section 4.02(1) hereof.

The scope of covered losses that falls within the meaning of this Section 4.01C shall be determined by reference to the last insurance policy in effect for losses at the HGP-A plant under Section 4.02(1) of this agreement, less the amount of any deductible under such policy.

- D. In the event of any claim against Indemnitees covered under this Article IV, Indemnitees will notify TPC of such claim within fourteen (14) days of Indemnitees' receipt of it, and TPC shall promptly arrange for the defense or defense and indemnification of Indemnitees in connection with the claim.
- E. With respect to the promises to defend or indemnify and defend in Sections 4.01A, 4.01B and 4.01C hereof, in each instance, RCUH, for itself and as agent for the Indemnitees, must consent to the attorney(s) chosen by TPC to defend Indemnitees, which consent shall not unreasonably be withheld, provided however, that it shall be reasonable for RCUH to withhold consent if RCUH demonstrates the existence of a conflict of interest with respect to involvement by such attorney(s) in any matter related

to the claim indemnified against or geothermal rights affecting the State of Hawaii. RCUH otherwise may withhold its consent to TPC's choice of counsel, in which event RCUH shall retain separate counsel for itself and Indemnitees and defend at their sole cost.

- F. With respect to the promises to indemnify in Sections 4.01A and 4.01C hereof, in each instance, RCUH, for itself and as agent for the Indemnitees, shall be the final judge of the acceptability of any compromise or settlement of any claim against Indemnitees, provided, however, that if RCUH rejects any such compromise or settlement and the ultimate liability, including costs of litigation, exceeds the cost of such compromise or settlement, Indemnitees shall be solely responsible for all such excess costs, including the judgment, interest thereon, attorneys' fees and court costs.
- G. With respect to the promises to defend or indemnify and defend in Sections 4.01A, 4.01B and 4.01C hereof, in each instance, if TPC wrongfully fails or refuses to defend or indemnify Indemnitees, Indemnitees shall undertake their own defense, and TPC shall reimburse Indemnitees for the costs and

reasonable attorneys' fees incurred therefor or fees for the reasonable value of the attorneys' services rendered if the Department of the Attorney General defends, together with interest thereon from the date such costs are incurred and attorneys' fees paid or attorneys' services rendered, at the rate provided for in Section 3.02.

- H. Nothing in this Article IV shall preclude TPC from proceeding against such other parties who are or may be responsible for the loss or damage to an injured person.
- I. The duty to defend or indemnify on the part of TPC under this Section 4.01 shall exist only to the extent that there is no right on the part of Indemnitees to defense and indemnity under the insurance policies set forth in Section 4.02 hereof.
- 4.02 <u>Insurance</u>. TPC will exercise best efforts to purchase and maintain the insurance specified below. The cost of such insurance will be included as part of the operating and maintenance expenses to be reimbursed under Section 3.02 hereof.

- Liability (1) Comprehensive General Insurance including coverage for premises-operations and contractual liability with minimum limits of \$10,000,000.00 per occurrence for bodily injury or death. It is understood and agreed that TPC coverage through may provide such the corporate-wide policy or policies under which operations generally insured. its are
- Fire insurance for at least \$5,000,000, or such (2) other amount as may be specified by RCUH from year not to exceed 90% to replacement cost, including the perils of fire lightning with the extended coverage and malicious endorsement vandalism and and mischief endorsements. The loss payment clause shall name TPC as trustee for loss adjustment purposes with each party affected to receive payment for loss as their interests may appear.
- (3) Boiler and machinery insurance with a limit of at least \$1,000,000. The loss payment clause shall name TPC as trustee for loss adjustment purposes with each party affected to receive payment for loss as their interests may appear.

Each of the Indemnitees shall be additional insureds on each of the foregoing policies. To the extent that either party has insurance (including self-insurance) concerning the properties and activities that are the subject of this Agreement, each party agrees to furnish waivers of subrogation.

RCUH, for itself and as agent for the Indemnitees, be provided with notice (in the described in Section 12.04 hereof), of not less than 60 days in advance of any cancellation of said policies, provided, however that if said policies provide for less than 60 days' advance notice, such shall be provided to RCUH as soon notice reasonably possible after receipt from the insurer(s). In the event that said policies or any of them are not in force during the period of time that TPC operates the HGP-A plant, within 30 days of Indemnitees' request, TPC shall furnish to RCUH proof ability to undertake the indemnity TPC's of provisions of Section 4.01C hereof. If RCUH, for reasonably itself and as agent for Indemnitees, determines that TPC is unable to meet the provisions of Section 4.01C hereof, RCUH may, in its discretion, terminate this agreement forthwith, unless TPC posts

- a bond, provides a letter of credit or furnishes other similar assurance, which bond, letter of credit or similar assurance shall be satisfactory to RCUH, substantially in the amount of the insurance previously in effect under Section 4.02(1) hereof, less the amount of any deductible under such policy.
- 4.03 Benefits. TPC shall be solely responsible for workers' compensation and all other employee benefits required by law to be provided to personnel working at the HGP-A plant during the term of this agreement. The cost of such benefits shall be part of the operating and maintenance expenses to be reimbursed under Section 3.02 hereof.

## ARTICLE V. PRIVITY OF AGREEMENT

Except as otherwise provided herein, this Agreement is not intended and shall not be construed in any manner so as to benefit any third party; nor is it intended nor shall it be construed in any manner such as to place TPC or RCUH in privity with any parties who might have a contract to purchase electric energy from HELCO; nor is it intended nor shall it be construed in any manner so as to impose a duty upon RCUH or TPC to supply electric energy to the public or any portion of the public or to any private person or parties not a party to this Agreement, or to supply electric energy to any particular locality or district in the County of Hawaii.

## ARTICLE VI. TERM OF AGREEMENT

- 6.01 The term of this Agreement shall commence (i) on the date of execution hereof or (ii) upon satisfaction of the conditions set forth in Article X below, whichever is later, and shall terminate on December 31, 1990 unless earlier terminated pursuant to Section 2.04, 4.02 or Section 6.02. Upon expiration of its term, this Agreement will automatically continue for additional one (1) year periods until terminated in accordance with Section 2.04, 4.02 or Section 6.02.
- 6.02 Either party may terminate this Agreement at any time by giving not less than ninety (90) days prior written notice of termination to the other party, provided, however that neither party shall have the right to give notice of termination under this Section 6.02 prior to the expiration of six (6) months after the date the steam and brine supply facilities have been constructed and installed as provided in Article I of this Agreement.

### ARTICLE VII. FORCE MAJEURE

Neither party shall be liable to the other in the event either party is unable to perform its responsibilities Agreement due to storm, under this lightning, rain, hurricane, flood, tidal wave, fire, epidemic, quarantine war, sabotage, act of public restriction. earthquake. eruption. insurrection. riot, civil disturbance, order of any court, judge or civil authority or any other event of force majeure beyond the exclusive control of a party and not attributable to its neglect.

# ARTICLE VIII. DISPUTES AND ARBITRATION

8.01 Any controversy, claim or dispute concerning a question of interpretation or fact arising under this Agreement which is not disposed of by agreement of the parties shall be referred for resolution to a senior official of RCUH and of TPC (of a level of director or manager or higher, or the equivalent). These officials may, if they so desire, consult outside experts for assistance in arriving at such resolution. Any such controversy, claim or dispute not resolved within thirty (30) days pursuant to the foregoing or otherwise by mutual agreement between the parties, may be submitted to arbitration by either party under Section 8.02.

Arbitration shall be conducted as follows: the party desiring arbitration shall give the other written notice of such desire, which notice shall state with reasonable specificity each claim dispute in controversy and shall specify the names of at least three (3) neutral arbitrators acceptable to the party initiating arbitration. Within thirty (30) days of receipt of such notice, the receiving party shall respond in writing to such notice which response shall include a reasonably specific statement of the answering party's view of each claim or dispute in controversy, including any defenses, offsets and counterclaims arising out of or relating thereto, and shall designate at least three (3) neutral arbitrators. Within ten (10) days of receipt of such response, the parties shall meet to determine whether settlement of one or more of the claims or disputes can be agreed upon. Ιf either party dispute cannot be determines that any claim or settled to its satisfaction following such meeting, arbitration shall be conducted as follows: the party desiring arbitration shall notify the other party of such desire and, within ten (10) days of such notice, each party shall designate one arbitrator from the names previously provided. The two arbitrators so designated shall select and appoint arbitrator, and in the event the two arbitrators shall fail to appoint the third arbitrator within ten (10) days after the naming of the second arbitrator, either party may have the third arbitrator appointed by a judge of the Circuit Court, State of Hawaii. The three arbitrators so appointed shall thereupon proceed to determine each claim or dispute that remains in controversy and the decision of any two of them shall be final, conclusive and binding upon all parties, all as provided in Chapter 658 of the Hawaii Revised Statutes, as the same may be amended. Judgment may be entered upon any such arbitration decision by the Circuit Court as provided in said In all cases of arbitration each of the parties shall pay the expense of its own attorneys' expenses witnesses' fees. All other arbitration shall be divided equally between parties.

## ARTICLE IX. WARRANTIES

- 9.01 Each party to this Agreement represents and warrants (but only with respect to itself) that:
  - (a) Each respective party has all necessary right, power and authority to execute, deliver and perform this Agreement.

- The execution, delivery and performance of this (b) Agreement by each respective party will not result in a violation of any law or regulation any governmental authority, or conflict with, or result in a breach of, or cause a agreement or any other under, default instrument to which such party is also a party by which it is bound, except for the Purchase Agreement between RCUH and HELCO until such time as the conditions in Section 10(b) shall have been satisfied.
- 9.02 RCUH further warrants and represents that:
  - (a) RCUH is a body corporate constituting a public instrumentality duly organized and existing under Chapter 307 of the Hawaii Revised Statutes ("the Act").
  - (b) The Act authorizes RCUH to enter into agreements and to carry out the transactions contemplated under this Agreement.
  - (c) NELH is the owner of the HGP-A plant, and no other person has any interest therein such that it should be a party to this Agreeement.
  - (d) RCUH is the manager and agent for NELH and has agreed with NELH to operate, maintain and test the HGP-A plant.
  - (e) The Board of Directors of NELH has approved this Agreement.

# ARTICLE X. CONDITIONS PRECEDENT

This agreement shall not be effective and the parties shall have no obligations hereunder until such time as the following conditions precedent have been met to the satisfaction of the parties:

- (a) TPC and RCUH shall have obtained all permits, licenses, easements, rights-of-way and other approvals necessary for (i) the construction and installation of the steam supply facilities and the brine supply facilities, and (ii) the operation of such facilities, the KS-lA well and the HGP-A plant as contemplated in this Agreement.
- HELCO and RCUH shall have entered (b) their Purchase Agreement amendment to provide that (i) TPC shall take over operation and maintenance of the HGP-A plant upon a date mutually acceptable to RCUH and TPC following following HELCO of the by completion TPC's satisfaction maintenance activities to (A) opening of the and at no cost to TPC: turbine for inspection and repair, including of existing turbine seals, (B) replacement review, repair and modification of the

abatement system, including the rock muffler and associated piping and chemical abatement equipment, and (C) any other repairs modifications to the HGP-A plant which RCUH and TPC agree to have made before TPC takes over operation and maintenance of the HGP-A plant under this Agreement; (ii) HELCO will continue to purchase power from the HGP-A plant under the terms of the Purchase Agreement; (iii) HELCO will continue to furnish power for operation of the HGP-A plant in accordance with the terms of the Purchase Agreement; and (iv) HELCO will continue to operate and maintain the interconnection facilities that interconnect the HGP-A plant with HELCO's system as provided in the Purchase Agreement.

- (c) RCUH, for itself and as agent for Indemnitees, shall approve and accept, in its own discretion, a certificate of insurance for each of the insurance agreements that will be issued pursuant to Section 4.02 hereof.
- (d) In the event that the insurance set forth in Section 4.02(1) cannot be obtained for any reason, TPC shall provide to RCUH, as agent for Indemnitees, proof of TPC's ability to perform

the indemnity undertakings set forth in Section 4.01C hereof. If RCUH reasonably determines that TPC is unable to perform the indemnity undertakings set forth in Section 4.01C hereof, this condition precedent shall not have been met, unless TPC posts a bond, provides a letter of credit or furnishes other similar assurance, which bond, letter of credit or similar assurance shall be satisfactory to RCUH, substantially in the amount of the insurance set forth in Section 4.02(1) hereof, less the amount of any deductible under the policy in effect pursuant to the Purchase Agreement.

(e) The Board of Directors of NELH shall have approved this Agreement.

The parties agree to cooperate fully in satisfying the above conditions.

## ARTICLE XI. REPORTS AND AUDIT

11.01 The parties agree to furnish reports regarding the operation of and revenues from the HGP-A plant and capital costs of the steam supply facilities and brine supply facilities in accordance with Exhibit C attached hereto and incorporated herein by this reference.

- 11.02 All bills, statements and reports furnished during any calendar year pursuant to this Agreement shall conclusively be deemed to be true and correct after twenty-four (24) months following the end of such calendar year, unless within said twenty-four (24) month period a party takes written exception thereto and makes claim for adjustment to the other party.
- 11.03 Upon written notice to the other party, a party shall have the right to audit such other party's accounts and records relating to costs and expenses under Section 3.02 for any calendar year within the twenty-four (24) month period following the end of such calendar year, but the making of any audit shall not extend the period for taking written exception to any bill, statement or report under this Article XI. Each audit shall be conducted at the sole expense of the party conducting such audit.

## ARTICLE XII. MISCELLANEOUS

12.01 Amendments. Any amendment or modification to this Agreement or any part hereof shall not be valid unless in writing and signed by the parties. Any waiver hereunder shall not be valid unless in writing and signed by each party against whom waiver is asserted.

- 12.02 Assignment. Neither party shall assign this Agreement nor any of its rights or obligations hereunder without the prior written consent of the other party, which consent shall not be unreasonably withheld.
- 12.03 Binding Effect. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors, legal representatives, and permitted assigns.
- 12.04 Notice. Any written notice provided hereunder shall be delivered personally or sent by registered or certified first class mail, with postage prepaid, to the other party at the following address:

RCUH: Research Corporation of the

University of Hawaii

1110 University Ave. #402 Honolulu, Hawaii 96826

TPC: Thermal Power Company

Central Pacific Plaza 220 South King Street

Suite 1750

Honolulu, Hawaii 96813

Notice sent by mail shall be deemed to have been given on the date of actual delivery or at the expiration of the fifth day after the date of mailing, whichever is earlier. Any party hereto may change its address for written notice by giving written notice of such change to the other party hereto.

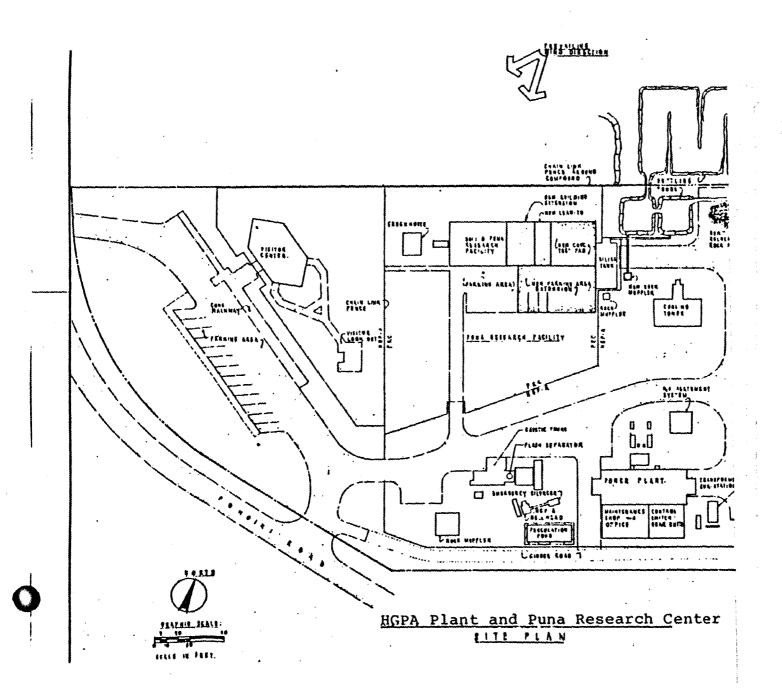
- Agreement shall be deemed to constitute either party hereto as partner, agent or representative of the other party or to create any fiduciary relationship between the parties. TPC shall be an independent contractor with respect to the performance of all work hereunder and neither TPC nor anyone employed by TPC shall be the employee, agent, servant, or representative of RCUH in the performance of any work or service hereunder. RCUH shall have no direction or control of TPC or its employees and agents.
- Upon reasonable notice and during normal 12.06 Access. business hours, RCUH, or its representative, shall have access to the HGP-A plant to determine whether work is being performed by TPC in accordance with the provisions of this Agreement. In addition, RCUH shall have the right upon prior written notice and during normal business hours to conduct tours of the HGP-A plant provided that such tours do not interfere with TPC's operations and provided further that such tours shall be conducted subject to such safety procedures as may be required by TPC and agreed to by Notwithstanding the foregoing, in the event any insurance coverage required under Section 4.02 hereof is not in full force and effect, such tours shall not be permitted.

- 12.07 Entire Agreement. This Agreement constitutes the entire understanding and agreement between the parties.
- 12.08 Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Hawaii.
- 12.09 <u>Further Assurances</u>. Each of the parties shall from time to time and at all times do such further acts and deliver all such further documents and assurances as shall be reasonably necessary fully to perform and carry out this Agreement.
- 12.10 Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original and all of which, when taken together, shall constitute one and the same agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first written above.

RESEARCH CORPORATION OF THE UNIVERSITY OF HAWAII	THERMAL POWER COMPANY	
BY: (A) Cospos  Director of Administration	BY: President	ISK

0169L



# EXHIBIT C

# REPORTS

Title, Content		Frequency	To	
1.	Technical Progress Report	6 months	RCUH/NELH	
	<ul> <li>Power Data</li> <li>Abatement System Log</li> <li>Maintenance Notes</li> <li>Forced Outage Log</li> </ul>			
2.	Job Cost Details	Monthly	RCUH/NELH	
3.	Operating Figures	Monthly	RCUH/NELH	
	Steam Flow Brine Flow Net KWH generated Operating Hours Maintenance Summary			
4.	Complaints	As occurring	RCUH	
5.	Accidents/Incidents	As occurring	RCUH	
6.	Revenues	Monthly	TPC	
7.	Capital Costs to Install Steam Supply Facilities and Brine Supply Facilites	6 months	RCUH/NELH	



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07 FEB 18 A8: 09

February 10, 1987

DIV OF WATER & LAND DEVILED MENT

VIA COURIER

Mr. William Paty, Chairman Board of Land and Natural Resources State of Hawaii Kalanimoku Building 1151 Punchbowl Street Honolulu, HI 96813

Geothermal Resources Exploration Indemnity Bond RE:

Thermal Power Company, A Subsidiary of Diamond Shamrock

Dear Mr. Paty:

On December 9, 1986, Thermal Power Company, Operator for the Puna Geothermal Venture, submitted an application for an Exploration Permit to conduct a Controlled Source Audio Magnetotelluric (CSAMT) survey in the Puna District of Hawaii in early 1987. In compliance with Department of Land and Natural Resources requirements for approval of Exploration Permits, enclosed is a \$10,000 Geothermal Resources Exploration Indemnity Bond naming State of Hawaii as surety.

Please feel free to contact me at (415) 765-0346 if you have any questions.

Sincerely,

Janet A. Wood Land and Contract Representative

JAW/jd:0294L

Enclosure

601 California Street, San Francisco, California 94108, Phone 415, 981-5700, Telex 34387 DIASI

Bond	No.	700-09-60

# GEOTHERMAL RESOURCES EXPLORATION INDEMNITY BOND .

KNOW ALL MEN BY THESE PRESENTS:

That we, Thermal Power Company, as pri	NATIONAL FIRE INSURANCE ncipal: and COMPANY OF HARTFORD
organized and existing under and by virtue	
and authorized to transact surety business	
are held and firmly bound unto the State of	f Hawaii in the full and just sum of
TEN THOUSAND AND NO/100 DOLLARS (\$10,000)	lawful money of the United States of
America, to be paid to the State of Hawaii	, for which payment, well and truly
to be made, we do hereby bind ourselves, o	our heirs, executors, administrators,
successors and assigns, jointly and several	lly, firmly by these presents.
Signed, sealed, delivered and dated this _ 19_87.	26 day of <u>January</u> ,
THE CONDITION OF THE ABOVE OBLIGATION IS SU	JCH THAT,
WHEREAS, said Principal is about to condu	ct <b>e</b> xploration activity on state or
reserved lands for evidence of Geothermal	
is required to file this bond in connec	ction therewith in accordance with
Section 13-183-8 of Chapter 183, Adminis	trative Rules of the Department of
Land and Natural Resources, State of Hawaii	•
NOW, THEREFORE, if said THERMAL POWER C	
bounden principal, shall well and truly con	
Chapter 183 and shall obey all lawful ord Land and Natural Resources, or his repre	
Board of Land and Natural Resources, or u	
of Land & National Resources if appealed	•
costs, and expenses incurred by the Chairm	
of such well or the property or propert	
against such well or the property or	properties of such principal, in
pursuance of the provisions of said Chapter	
void; otherwise, it shall remain in full fo	orce and effect.
Countersigned	THERMAL POWER COMPANY
By Hawaii Resident Agent	DV 198-11-
nawa ii kesident Ayent	By: Rilard J. Patteger P.W.
Approved as to form:	NATIONAL FIRE INSURANCE COMPANY OF HARTFORD
	•
	By: Dr Van Hock
Deputy Attorney General	Pat Van Hook
Date:	Its: <u>Attorney-in-Fact</u>

And By:\_\_\_\_

STATE OF MAMAYY CALIFORNIA

City and County of ROWNING San Francisco

On this 9th day of February , A.D. 19 87 , before me appeared
Richard T. Pittenger
to me personally known, who, being by me duly sworn, did say that he is the
Vice President - Operations
respectively of Thermal Power Company
and that the seal affixed to the foregoing instrument is the corporate seal of
said corporation and that said instrument was signed and sealed in behalf of
said corporation by authority of its Board of Directors, and the said
Richard T. Pittenger acknowledgessaid instrument to be the free
act and deed of said corporation.
NOTARY PUBLIC
JANETA WOOD My Commission Expires May 24, 1988  Output of San Francisco.
My Comm Expires Mcy 24 198:
STATE OF CALAFORINA TEXAS
County of Dallas
On this 26 day of January , 1987 , before me, Joann Ashby
Texas a Notary Public in and for the State of /C/a/1/i/f/b/h/f//a with principal office in
the County of <u>Dallas</u> residing therein, duly commissioned and sworn,
personally appeared Pat Van Hook , known to me to be the person
whose name is subscribed to the within instrument as the attorney-in-fact of
the National Fire Insurance Company of Hartford , the corporation named as
Surety in said instrument, and acknowledged to me that he subscribed the name
of said corporation thereto as Surety, and his own name as attorney-in-fact.
IN WITNESS WHEREOF, I have hereunto set me hand and affixed by official seal,
at my office in the aforesaid County, the day and year in this Certificate first
above written.  NOTARY PUBLIC  NOTARY PUBLIC
NOTARY PUBLIC
Occurred Control of Co
<del>တလတ်ထိထထထထထထထထထထထ</del> ထ

### RESIDENT AGENT COUNTER-SIGNATURE ENDORSEMENT

In order to comply with the Resident Agent Laws of the State of Hawaii, the counter-signature hereto is to be considered the valid counter-signature to the undermentioned bond.

to and hereby made a part of Bond No. 700-09-60
NATIONAL FIRE INSURANCE COMPANY OF HARTFORD
THERMAL POWER COMPANY
STATE OF HAWAII
this 30th day of January 19 87
Marsh & McLennan, Inc. P. O. Box 38 Honolulu, Hawaii 96810  By: Molecus Resident Agent

National Fire Insurance Company of Hartford



Office/Chicago, Illinois POWER OF ATTORNEY APPOINTING	INDIVIDUAL ATTORNEY-IN-FACT
Know All Men by these Presents, That the NATIONAL FIRE INSUlaxisting under the laws of the State of Connecticut, and having its general	RANCE COMPANY OF HARTFORD, a corporation duly organized and I administrative office in the City of Chicago, and State of Illinois, does
hereby make, constitute and appoint John D. Fulkerson, Mary	L. Tatro, Lawrence W. Waldie,
Brenda Martin, Henry W. Burch, III, Bernice	
Individually	
of Dallas, Texas its true and lawful Attorney-in-Fact with full power and authority hereby co	
other obligatory instruments of similar nature	Amounts -
and to bind the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD the by the duly authorized officers of NATIONAL FIRE INSURANCE COMPAN authority hereby given are hereby ratified and confirmed.	ereby as fully and to the same extent as if such instruments were signed NY OF HARTFORD and all the acts of said Attorney, pursuant to the
This Power of Attorney is made and executed pursuant to and by auth the Board of Directors of the Company.	nority of the following Resolution duly adopted on February 21, 1955 by
by written certificates, Attorneys-in-Fact to act in behalf of the Corpor- other obligatory instruments of like nature. Such Attorneys-in-Fact, subj shall have full power to bind the Corporation by their signature and ex	any Vice President of the Corporation may, from time to time, appoint, ation in the execution of policies of insurance, bonds, undertakings and ject to the limitations set forth in their respective certificates of authority, ecution of any such instrument and to attach the seal of the Corporation dent or the Board of Directors may at any time revoke all power and
· · · · · · · · · · · · · · · · · · ·	by the authority of the following Resolution adopted by the Board of ay of May, 1964.
affixed by facsimile on any power of attorney granted pursuant to the and the signature of a Secretary or an Assistant Secretary and the sea such power, and any power or certificate bearing such facsimile signa power so executed and sealed and certified by certificate so executed is attached, continue to be valid and binding on the Corporation.	ce President or a Vice President and the seal of the Corporation may be e Resolution adopted by this Board of Directors on February 21, 1955 all of the Corporation may be affixed by facsimile to any certificate of any stures and seal shall be valid and binding on the Corporation. Any such I and sealed, shall, with respect to any bond or undertaking to which it
In Witness Whereof, the NATIONAL FIRE INSURANCE COMPANY OF	HARTFORD has caused these presents to be signed by its Vice President
and its corporate seal to be hereto affixed this 25th day of	June , 19 <u>85</u> .
SE INSURANCE	NATIONAL FIRE INSURANCE COMPANY OF HARTFORD
( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	J. E. Purtell Vice President.
	J. E. Purtell Vice President.
Ta Mas Try D	J. E. Pullell
State of Illinois, County of Cook, ss:	
On this 25th day of	June , 19 85 , before me personally came
•	
	ity given by the Board of Directors of said corporation and that he signed.
NOTARY PUBLIC	Leslie A. Smith Notary Public.  My Commission Expires November 12, 1986
OF DATE:	•
M. C. Vonnahme CERTIFI	the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, do hereby
certify that the Power of Attorney herein above set forth is still in force, an in said Power of Attorney are still in force. In testimony whereof I have her	id further certify that the Resolutions of the Board of Directors, set forth
WEURAL	
	Assistant Secretary.
	M. C. Vonnahme
6-23142-C	

STATE OF HAWAII

Insurance Division

General Agent's Ticense

KNOW ALL MEN BY THESE PRESENTS THAT

ACKERYAN/CYTILINGUORTH;/A/DIVISION/OF

Name MARSH & MCLENNAN, INCORPORATED

Classes of Insurance) \*CASUALTY, FIRE, MARINE, MOTOR \*
Authorized) \*VEHICLE \* LIFE (Rff. 6/20/72) \*
\*SURETY \* DISABILITY \*

Issue Date June 15, 1972.

Designated Representatives

Lés1ié/L/Ctarlét//\$t/

Vadé/L/Shérhán/L/C!Y/M/Y/\$

M. G. Chillingworth-D.C.F.M.MV,S
William Steven-D.C.F.M.MV,S,L

Kenneth K./Kanehiro-C.F.M.MV,S/L
Wilfred Nishioka-L.D.C.F.M.MV,S

ALLEY/L//Tokat/L/L/L/J/J/J/J/S/L

baving complied with the requirements of the laws, is hereby licensed to transact the above-named classes of insurance. This license is valid until terminated by surrender, revocation, or failure to extend. A new license will not be issued upon extension. This license shall remain in the possession of the licensee named herein until termination, at which time it must be delivered to the Commissioner.

Designated Representatives (Cont'd)
Bradley C. Oliver-L,D
Rocco C. Sansone-D,C,F,M,MV,S

GIVEN UNDER MY HAND AND SEAL at Honolulu, Hawaii

INSURANCE COMMISSIONES

FORM 400 (6-69)

#### HAWATT INSURANCE DIVISION

#### NOTICE OF APPOINTMENT OF GENERAL

, N C	TICEO	FAPPOIN	TMENT OF	GENEKAL		Z M Tarribid
TO I	HE INSURANCE	COMMISSIONER OF	THE STATE OF HAI	WAII:	JUI 24	9 se 111 183
	ints the Gene	ned Insurer, as ral Agent named sses of insuranc	below to transa	Hawaii Insurance	e Law, the In	hereby
		(Cross out cla	sses of insuran	e NOT wanted)		
(1)	FILE	(3) Casua	1ty (5)	Marine	(7)	Surety
(2)	Disability	(4) Fire	(6)	Notoes Velabolies	(8)	<b>Motober</b>
agen rema	Further, the cy appointment in in effect (	eneral Agent undersigned Ins t of the above G	urer hereby cert eneral Agent, an il terminated in	Business Adtifies to having that such appoint accordance with	idress made a sintmen	Hawaii, 96813 direct t shall
	•	ço, Illinois	on	May 18, 1983		
•		•	Full and By Title By	Pire Insurance exact name of I  Vice President  Secretary		
appoi	The undersign	ned General Agent forth above.	hereby consent	s to the direct	genera:	l agency
	Dated at	HONOLULU	, Hawaii, on	JUNE 22, 1983	}	
			Full and elac By Signature of acy; John Doe &	McLennan, Inc.  t name of Genera  Cluster  f Designated Rep Richard Roe, dba	resent	ative
Age :NOTE	• •	surance Agency of this	•	etc. filed with the	Incura	nce
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License No.

74. [11]

#### PRESS RELEASE

Hilo, Hawaii -- January 20, 1987

Thermal Power Company has announced the signing of an agreement with the Research Corporation of the University of Hawaii (RCUH) under which Thermal will become the operations and maintenance contractor for the HGP-A geothermal power plant in Puna. The agreement will continue and enhance the research conducted at the plant and the adjacent Noi'i O Puna geothermal research facility by connecting them with the nearby Kapoho State 1-A geothermal well. The term of the agreement runs until December, 1990.

The plant and research facility are owned and administered by the Natural Energy Laboratory of Hawaii (NELH) with RCUH acting as the business manager. The KS-lA well is owned by Thermal Power and its joint venture partner, Amfac Energy, Inc.

Thermal Power will build a 2500-foot pipeline to transport the steam from the KS-lA well to the power plant. Smaller pipes will carry the geothermal brine to Noi'i O Puna. Materials procurement, engineering design and construction of the test pipeline are expected to take several months; construction will begin when necessary approvals have been obtained. Actual delivery of steam from the KS-lA well will not occur until June at the earliest, but plans for the transition of plant operations from HELCO, which has been operating the HGP-A plant since startup in 1981, are now being developed.

The connection of the KS-lA well will provide a new source of steam and brine to the NELH facility. The arrangement is expected to increase the electrical output of the HGP-A plant slightly, since the KS-lA well produces about 15 percent more steam than does the HGP-A well now supplying the power plant. Electricity generated by the plant goes into

HELCO's electrical system on the Big Island. The geothermal brine will be used at the Noi'i O Puna facility which supports several experiments using geothermal heat and fluids for fruit and lumber drying, cloth dyeing, silica recovery for glass, and other direct use applications.

Steam from the KS-lA well will be provided to HGP-A at no cost to NELH. Under the agreement, the revenue from the sale of electricity to HELCO will be used to pay the plant and pipeline operating expenses. In addition, funds will be provided to the Noi'i O Puna to support its research activities. If there are enough funds from the electricity sales, Thermal Power will be reimbursed for some of its pipeline costs, and geothermal research in the Puna area will be supported. No profit from the agreement will go to Thermal Power.

The agreement represents an outstanding example of government-industry cooperation, which will provide the participants and the general public with more information on this new source of alternate energy. This increased knowledge is expected to improve decision making on the future course of geothermal development in Hawaii.

Thermal Power Company, with headquarters in San Francisco, is a wholly-owned subsidiary of Diamond Shamrock Corporation of Dallas. Thermal has an interest in The Geysers geothermal field in California and has been exploring for geothermal resources in the East Rift Zone of Kilauea since 1980. The company recently submitted an application to county and state agencies for development of a 25 megawatt geothermal plant on lands adjacent to the HGP-A facility.

(Map attached)

Contact: Ralph Patterson (808) 524-8940

## 3 February 1987

Mr. William Paty
Department of Land and
Natural Resources
1151 Punchbowl Street #130
Honolulu, Hawaii 96813

Re: Waiver of Royalties-Lease R-2

Dear Mr. Paty:

Under the terms of the recent agreement between Thermal Power Company ("TPC") and the Research Corporation of the University of Hawaii ("RCUH"), TPC is to operate the HGP-A plant; in addition, TPC will provide steam and brine from TPC's KS-lA well through a pipeline to be constructed by TPC and Puna Geothermal Venture ("PGV").

Thermal Power believes that building this pipeline and conducting the test will serve the research objectives for which the HGP-A plant was constructed. The test also will be an important part of the exploration program designed to prove the reservoir in the Kapoho area. There will be no sale of the steam, although monthly payments to PGV to amortize the pipeline cost and recover the plant operating and maintenance expenses will be made out of the revenues received by RCUH for the electricity produced by HGP-A. If the revenues are insufficient to cover the costs, PGV will fund the shortfall.

RCUH's Mining Lease S-4602 provides for the waiver of any royalties on geothermal resources produced from its leased land. The mining lease relating to TPC's KS-lA well, Mining Lease R-2, provides for a payment of a royalty of 10% of the gross proceeds from the sale or use of geothermal resources produced from the leased land.

Mr. William Paty
Page Two
3 February 1987

In keeping with the research nature of KS-1A steam deliveries to HGP-A and TPC's support guarantee for the HGP-A research facility, Thermal Power believes that royalties delivery of the steam by TPC to HGP-A should be waived. Previous discussions with DLNR staff have indicated that opportunities exist for a waiver of royalties with respect to geothermal resources produced from the KS-lA well transported to or used at the HGP-A plant. We believe that an amendment of the R-2 lease itself would be an appropriate way to implement such an action.

Thus, with the concurrence of the Lessee, Kapoho Land Partnership, Thermal Power requests that paragraph 5A of lease R-2 be changed by adding a last paragraph as follows:

"Lessor hereby waives the payment of any royalties for and during the term of the lease for geothermal resources or by-products produced on the leased land that are transported to or used at the HGP-A Plant or the Noi'i O Puna research facility, or in research activities directly connected with the above plant or facility. Provided, however, Lessee shall file with Lessor a quarterly statement showing the amount of geothermal resources or by-products produced, used, sold or otherwise disposed of and

Mr. William Paty
Page Three
3 February 1987

the computation and determination of royalties as if they were to be paid at the rate of ten percent (10%) of the gross amount or value of the geothermal resources and five percent (5%) of the gross amount or value of the geothermal by-products produced under this lease as measured at the wellhead and sold, utilized or otherwise disposed of by Lessee. Quarterly statements shall be filed no later than thirty (30) days after the end of each calendar quarter."

If there are any questions please do not hesitate to call me.

Sincerely yours,

RAP/cn PATTYROYL

Concur

Kapoho Land Partnership

RECEIVED

## FEB 0 5 1987 37 FEB 5 2: 14

DIV OF WATER & LAND DEVELOPMENT

Mr. Ralph S. Patterson Project Manager Thermal Power Company 220 South King Street, Suite 1750 Fonclulu, Hawaii 96813

Dear Mr. Patterson:

Subject: State Geothermal Rescurces Mining Lease No. R-2

The Department of Land and Matural Resources acknowledges the receipt of your second supplementary amendment to the current plan of operations covered under State Geothernal Resource Mining Lease No. R-2.

Pursuant to your earlier question concerning the waiver of royalties, please submit a formal request for such a waiver, including a copy of the final contract agreement between Puna Ceothermal Venture and the Natural Energy Laboratory of Hawaii.

Your amended plan of operations will be reviewed and a response to your request for approval will be forthcoming.

For any questions to the foregoing, please contact our Land Management Division at 548-6460 or Nr. Manabu Tagomori of our Water and Land Division at 548-7533.

Very truly yours,

WILLIAM W. PATY Chairperson of the Board

cc: Hawaii Board Member Hawaii District Land Office BOWALD-Tagomeri

MYM: jd



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. BOX 621 HONOLULU, HAWAII 96809 DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM AQUATIC RESOURCES CONSERVATION AND
RESOURCES ENFORCEMENT CONVEYANCES FORESTRY AND WILDLIFE LAND MANAGEMENT STATE PARKS WATER AND LAND DEVELOPMENT

the Chairperson

Mr. Ralph S. Patterson Project Manager Thermal Power Company 220 South King Street, Suite 1750 Honolulu, Hawaii 96813

For seview Plan of Ops.,
from date of acknowledgement

Dear Mr. Patterson:

Subject: State Geothermal Resources Mining Lease No. R-2

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Very truly yours,

WILLIAM W. PATY, Chairman

cc: Hawaii Board Member Hawaii District Land Office DOWALD-Tagomori

Bephone call from, I petto 1) The Ind Romandment to the Plan & Operation for R-2 will be submitted 12-3-86. (ie perlaining to the popular project. 2) Plan of operation for R-2 M: The 25 MW power plans will also be submitted on 12-11-80. (In addition to the Exploratory permet applications for grophysical worn outside the surzone 3) DONALO'S request to land my re: warry & robally is still pending Per Mike 5 - Thermal needs to submit copy of Contract agreement between NEIH, ROUH! Thermal when it is finalized. Also, Thermal needs to file formal request to the Board asking for royalty waiver. Pallirson

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October 3, 1986

#### **MEMORANDUM**

TO:

Mr. James Detor, Administrator

Land Management

FROM:

Manabu Tagomori

Thermal Power Co.'s Request for Waiver of Royalties SUBJECT:

Attached is a letter from Thermal Power Co. regarding their proposed project to supply geothermal fluids from Kapoho State No. 1-A (Geothermal Mining Lease R-2) to the HGP-A power plant and Puna Research Center.

Please give us your comments and recommendation concerning Thermal Power Co.'s proposal that royalty payments under Lease R-2 be waived.

Should you have any questions, please contact Albert Ching at Ext. 7619.

MANABU TAGOMORI

DN:ko Attach.

THERMAL GO AL NAKAJI (HILO OFFICE) 935-6073

1 Diden

Diamond Shamrock 327 411: 03 86 SEP 19 P Ralph A Spatterson, Jr. Thermal Power Company

September 18; 1986 WINGAL RESOURCES STATE OF HAWAII

Mr. Susumu Ono Chairman Board of Land and Natural Resources 1151 Punchbowl Street #130 Honolulu, Hawaii 96813

Dear Mr. Chairman:

Discussions over several months between Thermal Power Company, The Natural Energy Laboratory of Hawaii, and the Research Corporation of the University of Hawaii have produced the final stages of an agreement under which Thermal Power Company, as operator of the Puna Geothermal Venture (PGV), would operate the HGP-A plant. As a part of this agreement, Thermal Power will construct a pipeline to supply geothermal fluids to the HGP-A plant and the Puna Research Center for purposes of a long-term flow test of PGV's KS-lA well.

We believe that building this pipeline and conducting the test will serve the research objectives for which the HGP-A plant was constructed. The test also will be an important part of the exploration program designed to prove the reservoir in the Kapoho area. There will be no sale of the steam, although monthly payments to PGV to amortize the pipeline cost and recover the plant operating and maintenance expenses will be made out of the revenues received by RCUH for the electricity produced by HGP-A. If the revenues are insufficient to cover the costs, PGV will fund the shortfall.

We believe that for this non-commercial, research purpose no royalties for the delivery and use of the steam are required under the terms of State mining lease R-2. Nevertheless, several meetings and an exchange of letters with the DOWALD staff have indicated that a formal waiver of royalties (under the authority of Act 138 of the 1985 legislative session amending Chapter 182, HRS) may be desirable.

Mr. Susumu Ono Page Two 18 September 1986

I would appreciate your confirmation as to whether such a waiver request is necessary or an opportunity to discuss the matter with you more fully.

Sincerely yours

RAP/cn:0849L

cc: M. Tagomori, DOWALD

W. Coops, RCUH
J. Huizingh, NELH





Raiph A. Patterson, Jr. Hawaii Project Manager

OIV, OF WATER & September 18, 1946 DEVELOPMENT

Mr. Susumu Ono
Chairman
Board of Land and
Natural Resources
1151 Punchbowl Street #130
Honolulu, Hawaii 96813

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Sincerely yours,

RAP/cn:0849L

cc:

M. Tagomori, DOWALD

W. Coops, RCUH
J. Huizingh, NELH

Mr. Ralph A. Patterson, Jr. Hawaii Project Manager Thermal Power Company 220 South King St., Suite 1750 Honolulu, Hawaii 96813

Dear Mr. Patterson:

This is to acknowledge receipt of your letter dated September 18, 1986, concerning a waiver of royalty.

The matter of royalty payments as specified by geothermal resource mining lease R-2 will be reviewed by our Department.

Our response to your request will be forthcoming. Should you have any questions, please contact Manabu Tagomori at 548-7533.

Very truly yours,

SUSUMU ONO

Chairperson of the Board

MT:DN:ko



RECEIVED RECEIVED

Diamond Shamrock SEP 22 All: 03 86 SEP 19 P kalph A Patterson, Jr. Hawaii Project Manager Thermal Power Company

> MIV. OF WATER & DEPT. OF LAND LAND DEVELOPMENT 1988 NATURAL RESOURCES SEPTEMBER 1988 STATE OF HAWAII STATE OF HAWAII

Mr. Susumu Ono Chairman Board of Land and Natural Resources 1151 Punchbowl Street #130 Honolulu, Hawaii 96813

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Mr. Susumu Ono Page Two 18 September 1986

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RAP/cn:0849L

cc:

M. Tagomori, DOWALD

W. Coops, RCUH

J. Huizingh, NELH



HEGELVED

BE SEP Raiph As Fatterson Jr. Hawaii Project Manager

25 August 1986

LAND DEVELOPMENT

Mr. Manabu Tagomori Dept. of Land and Natural Resources Kalanimoku Bldg. #227 1151 Punchbowl Street Honolulu, Hawaii 96813

Dear Mr. Tagomori:

In reply to your letter of June 23rd regarding the proposed test pipeline between Kapoho State 1-A and the HGP-A power plant, the following additional information is provided for your review:

1) The proposed agreement between the Puna Geothermal Venture and RCUH provides that all electrical energy produced from the HGP-A plant will be owned by RCUH and sold by RCUH to HELCO under the existing sales agreement.

All revenue from the sale of energy will be maintained in a separate account for the benefit of RCUH, Thermal Power and Puna Geothermal Venture. Revenues received will be applied in the following order:

- a) To pay all production, severance or other taxes, if any, imposed upon the project.
- b) To pay royalties, if any, imposed upon the project or with respect to the geothermal resource furnished under the agreement.
- c) To reimburse Thermal Power Company and Puna Geothermal Venture for all operating and maintenance expenses under the agreement.
- d) To reimburse Thermal Power Company and the Puna Geothermal Venture for the capital costs of installing the pipeline as defined in the agreement, amortized without interest.

Mr. Manabu Tagomori Page Two 25 August 1986

- e) To provide money to NELH for operating funds supporting the Puna Research Center.
- f) To reimburse Thermal Power and PGV for any and all other claims, costs and expenses incurred, with prior approval of RCUH, in connection with the agreement.

If there are not enough RCUH/NELH funds available in the account to reimburse all of the above items, the shortfall will be funded by Thermal Power and carried forward to the next succeeding month. An interest charge at the prime rate plus 1/2 percent will be added.

If there is an excess of revenues over expenses for a given month, this excess will be carried in the account until enough surplus is on hand cover anticipated overhauls, unscheduled repairs, etc., as determined jointly by NELH TPC. Excess funds above this and surplus will be applied to research in the Puna area on geothermal fluids injection, emissions abatement, and other subjects as jointly determined.

Upon expiration of the agreement, the remaining positive balance, if any, will be utilized for research as above.

Please note that this is a major change from our original proposed agreement. Neither TPC, NELH, nor PGV will receive any of the excess funds, should there be any.

- Puna Geothermal Venture will provide a construction bond for 100% of the pipeline costs as required by the Department's administrative rules.
- 3) It is not contemplated that the testing program will be completed within the 6-9 months mentioned in your letter. The agreement with RCUH/NELH outlines that the test program will continue for a period of 4 years or until the proposed 25 MW power plant is ready for commercial operations.

Mr. Manabu Tagomori Page Three 25 August 1986

- 4) Future plans for the HGP-A well are at present, unknown. Puna Geothermal Venture has been talking with RCUH and NELH about several options for continued testing and maintenance of the well. It is also possible that it will be possible to sell steam from the HGP-A well to the proposed PGV commercial power plant.
- 5) Although the ownership of HGP-A equipment has not yet been transferred from the Department of Energy to NELH, it is not expected that DOE approval for the test agreement will be required. A request for transfer of ownership to the State has been made and approved by the DOE.
- 6) Ιt is believed that the existing Dow abatement system will be adequate to accomodate the H<sub>2</sub>S levels found in the KS-lA steam. During the flow testing of KS-1A during October of 1985, the hydrogen sulfide levels in the steam were measured at approximately 1200 ppm. It is our understanding that the steam from the HGP-A well contains approximately 900 ppm H2S.

Thermal Power Company has had several discussions with Dow regarding the capacity of their abatement unit and has received assurances that Dow will work closely with Thermal Power and NELH to insure that the abatement efficiency of the unit is maintained.

7) ANSI Power Piping Code B31.1 specifies that an overpressure protection device must be installed and certain criteria, but the selection of an appropriate device is the responsibility of the designer; rupture disk protection devices standard throughout the geothermal industry. safety relief valve offers some advantages to pipeline operation; however, the corrosive environment may impact its performance Most geothermal gathering systems, reliability. therefore, utilize rupture disks as the overpressure protection device. Installing both devices for this test period is being considered.

The turbine trip alarms will immediately indicate if a disk has ruptured. The pipeline can then be returned to service by isolating the ruptured disk for repairs; this procedure should be completed in less than an hour. The failure of a rupture disk is expected to be an extremely infrequent occurence.

Mr. Manabu Tagomori Page Four 25 August 1986

8) The project description discussed the dismantling and removal of pipeline and supports on the basis that most environmental assessments require a discussion of what would be done with the equipment and facilities when no longer required. As outlined above, there have been some discussions of selling HGP-A steam to a commercial power plant at the time when that plant is made operational. It is expected that the pipeline and its facilities will remain in place as long as there is a reasonable use for them.

An amended Plan of Operations will be submitted for geothermal leases R-2 and S-4602 which will reflect the operation and construction of the pipeline.

Correspondence has been sent and discussions with other State agencies and the County Planning Department have been held regarding the proposed pipeline. Approval of the County Planning Department is reflected in the attached letter dated July 2, 1986.

Approval of the Department of Health for the continued use of percolation ponds is expected in the near future. A copy of this approval will be forwarded when received.

Thermal Power Company was designated the Operator of the R-2 mining lease under a designation of operator filed with the Department on March 3, 1981.

If there are any further questions or information required, please contact the undersigned.

W. R. Coops

RCUH

Kalkli (O.

Sincerely yours,

R. A. Patterson Thermal Power Company

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cc: Pittenger Huizingh





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RECEIVED
JUL 0 7 1986

#### PLANNING DEPARTMENT

25 AUPUNI STREET • HILO, HAWAII 96720 (808) 961-8288

DANTE K. CARPENTER
Mayor

ALBERT LONO LYMAN Director

> ILIMA A. PIIANAIA Deputy Director

July 2, 1986

Mr. Ralph Patterson, Hawaii Project Manager Thermal Power Company Central Pacific Plaza Suite 1750 220 South King Street Honolulu, HI 96813

Dear Mr. Patterson:

Special Permit 468 - Thermal Power Company SP 78-307 - Department of Planning and Economic Development

This is in response to your letter of May 20, 1986 describing a proposed test pipeline between Puna Geothermal Venture's KS-lA well and the HGP-A power plant.

The building of this pipeline and the conducting of the test is an extension of the research objectives for which the HGP-A plant was originally built and is part of the exploration program designed to the reservoir in the Kapoho area. No amendments to the Special Permits granted to DPED and to Thermal Power Company will be required for this proposed use.

Special Permit No. 468 issued by the County of Hawaii's Planning Commission to Thermal Power Company contains the following condition:

"18. This special permit shall be effective until October 15, 1986, or upon the successful completion of the exploration program, whichever occurs sooner."

Section 6-8 Amendments of Conditions, of the Planning Commission's Rules states:

- "(b) In the case of time extensions, the petitioner shall file the request not less than ninety days prior to the expiration date of the time conditions, setting forth:
  - (1) The affected condition;
  - (2) The length of time requested; and
  - (3) The reasons for the request.

Mr. Ralph Patterson, Hawaii Project Manager July 2, 1986 Page 2 If the Planning Commission is not able to act on a properly filed time extension request prior to the expiration date, the use granted under the Special Permit may be continued, unless the Planning Commission specifically disallows the activity during the interim period. "(d) The petitioner shall also file a one hundred dollars publication fee, along with the original and ten copies of the request. "(e) The hearing and notice procedures and action shall be the same as under sections 6-5 and 6-7 of this rule, provided further that the Planning Commission shall conduct a hearing within a period of sixty days from the date of receipt of a properly filed petition, or within a longer period as may be agreed to by the Planning Commission." Should you have any questions, please feel free to contact me. Sincerely, ALBERT LONO LYMAN Planning Director RN:1kt cc: W. R. Coops



# DRAFT

#### **Diamond Shamrock** Thermal Power Company

Ralph A. Patterson, Jr. Hawaii Project Manager

25 August 1986

Mr. Manabu Tagomori
Dept. of Land and
Natural Resources
Kalanimoku Bldg. #227
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Tagomori:

BE AUG 26 A 9: U3

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1) The proposed agreement between the Puna Geothermal Venture and RCUH provides that all electrical energy produced from the HGP-A plant will be owned by RCUH and sold by RCUH to HELCO under the existing sales agreement.

All revenue from the sale of energy will be maintained in a separate account for the benefit of RCUH, Thermal Power and Puna Geothermal Venture. Revenues received will be applied in the following order:

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Mr. Manabu Tagomori Page Two 25 August 1986

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- 2) Puna Geothermal Venture will provide a construction bond for 100% of the pipeline costs as required by the Department's administrative rules.
- 3) It is not contemplated that the testing program will be completed within the 6-9 months mentioned in your letter. The agreement with RCUH/NELH outlines that the test program will continue for a period of 4 years or until the proposed 25 MW power plant is ready for commercial operations.

Mr. Manabu Tagomori Page Three 25 August 1986

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Mr. Manabu Tagomori Page Four 25 August 1986

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Correspondence has been sent and discussions with other State agencies and the County Planning Department have been held regarding the proposed pipeline. Approval of the County Planning Department is reflected in the attached letter dated July 2, 1986.

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Thermal Power Company was designated the Operator of the R-2 mining lease under a designation of operator filed with the Department on March 3, 1981.

If there are any further questions or information required, please contact the undersigned.

Sincerely yours,

W. R. Coops

R. A. Patterson Thermal Power Company

encl

cc: Pittenger Huizingh bcc:

T. Yoshihara J. Kumin M. Richard

AUG 27 1096

dia,)

Mr. Albert Lono Lyman Planning Director Planning Department County of Hawaii 25 Aupuni Street Hilo, Hawaii 96720

Dear Mr. Lyman:

The Department of Land and Natural Resources has no objections to the approval of the amendment referenced in your memorandum dated July 22, 1986, regarding Thermal Power Company's request for a three-year extension of Special Use Permit #468. The approval of the amendment authorizing the continuation of exploratory evaluations of geothermal well, Kapoho State No. 1-A, and additional geophysical surveys is not in conflict with our Department's Administrative Rules or the provisions of State Geothermal Resource Mining Leases R-2 and S-4602.

Thank you for the opportunity to review and comment on the request by Thermal Power Company. In addition, the Department respectfully asks that copies of Rule 12 as adopted recently by the Planning Commission be forwarded to our office at your earliest convenience. Should you have any questions, please contact Mr. Manabu Tagomori at 548-7533.

Very truly yours,

SUSUMU ONO

Chairperson of the Board



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DEPL. D. LAND

& NATUMAL MESOURCES

STATE OF HAWAII

# PLANNING DEPARTMENT | 86 AUG 20 A(8: 07) 25 AUPUNI STREET | HILO, HAWAII 96720

(808) 961-8288

DANTE K. CARPENTER Mayor

ALBERT LONG LYMAN Director

> ILIMA A. PIIANAIA **Deputy Director**

August 19, 1986

COUNTY OF HAWAII 

Susumu Ono, Chairman Department of Land and Natural Resources P. O. Box 621 Honolulu, HI 96809

Dear Mr. Ono:

Time Extension to Special Permit No. 468 Thermal Power Company

This is a follow-up to our memorandum of July 22, 1986 requesting comments on the request filed by Thermal Power Company for a time extension to Special Permit No. 468 which allowed for drilling and evaluation of two successful exploratory geothermal wells on four acres of land situated within the State Land Use Agricultural District at Kapoho, Puna.

The Planning Commission will be conducting a public hearing on the request on August 28, 1986. We would, therefore, appreciate any comments that you may have on the request to extend the life of the Special Permit by that date.

Enclosed for your use is another copy of the request. Should you have any questions, please feel free to contact us.

Sincerely,

ALBERT LONG LYMAN Planning Director

NH:wk

Encl.



Hawaii, Hilo, Hawaii 96720 County of PLANNING DEPARTMENT

DPW

R & D

Dept. of Agr.

To:

DWS

Police

Helco-Eng.Div. Date: July 22, 1986

Highways Health

Fire

Soil Conserv.

DLNR ) Rod/Brian

From:

Planning Director Q. D.

Subject: Amendment to Special Permit No. 468

Extension to Life of Permit

Thermal Power Company

1-4-01:Pors. 2 & 19

The attached amendment to Special Permit 468 is being transmitted for your review and comments. May we please have your written comments by August 5, 1986.

Thank you very much.

NH:lv

Att.



rain vita

Al Lono Lyman Planning Director County of Hawaii 25 Aupuni Street Hilo, HI 96720

July 11, 1986

#### Dear Mr. Lyman:

Enclosed please find a request to extend Special Use Permit #468 for a period of three years. PGV is requesting no change in any permit conditions. All conditions will be complied with as in the original permit.

The exploration program carried out under the existing Special Use Permit #468 issued to Puna Geothermal Venture by Hawaii County provided for the drillng, completion and flow testing of two exploratory wells on the Kapoho State lease. This permit was extended for three years on November 22, 1983. The Special Use Permit was amended on February 9, 1984 to allow a replacement well to be drilled. The purpose of these wells was to demonstrate the northeastward extension of the high temperature geothermal reservoir discovered in 1976 by the Hawaii Geothermal Project.

Continuing exploratory evaluations require the extension of the existing Special Use Permit for three years. Three separate technical programs are contemplated, with a common objective of obtaining substantial additional information about the extent, behaviour and processes of the Kapoho geothermal reservoir. This work is preparatory to the development of the commercal phase of the project. These programs are explained below.

- 1. Long term test of PGV Well KS-1A. KS-1A will be used in a flow mode to supply geothermal effluent to the HGP-A Plant and Puna Research Facility. Well KS-1A, with a 2444-foot perforated interval between 4061 and 6505 feet, is believed to be completed in the upper portion of the geothermal reservoir; this reservoir is believed to extend to greater unknown depths. The HGP-A discovery well, with a 3550-foot completion interval between 2900 and 6450 feet, may be producing from two different zones and fluid sources. An intended 3-4 year flow test will be evaluated against the five year production record of the HGP-A well to obtain new insights to optimal reservoir development and production.
- 2. Continuing evaluation of the KS-1A well. In a safe and cost effective program correlated with ongoing studies of the KGP-A well, an evaluation will be made of the KS-1A well including shut-in wellbore observations and sampling of pressure, temperature, fluids and chemical species correlated with depth.

#### 3. Geophysical Analysis:

Additional geophysical surveys (to be executed and) calibrated with all existing well data, to refine a baseline data bank on the geothermal reservoir extent, internal qualities and production potential.

In addition to the technical evaluation of the wells, further studies of the Kapoho leasehold for wellfield development are to be carried out in support of the planned 25 MW power plant. These are expected to include studies of well pad locations, surface usage plans and hydrology studies and fluid injection tests.

We appreciate your prompt attention to this matter. If more information is required, please contact us immediately.

Sincerely,

Maurice A. Richard Senior Engineer

KJT/dg 0307E

cc: R.A. Patterson/R.T.Pittenger/M.A.Richard

K.J. Tobias/S/R. Office

Mr. Ralph Patterson, Hawaii Project Manager Thermal Power Company Central Pacific Plaza Suite 1750 220 South King Street Honolulu, HI 96813

Dear Mr. Patterson:

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The building of this pipeline and the conducting of the test is an extension of the research objectives for which the HGP-A plant was originally built and is part of the exploration program designed to the reservoir in the Kapoho area. No amendments to the Special Permits granted to DPED and to Thermal Power Company will be required for this proposed use.

Special Permit No. 468 issued by the County of Hawaii's Planning Commission to Thermal Power Company contains the following condition:

\*18. This special permit shall be effective until October 15, 1986, or upon the successful completion of the exploration program, whichever occurs sooner.\*

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July 2, 1986

Hr. Ralph Patterson, Hawaii Project Manager July 2, 1986 Page 2 If the Planning Commission is not able to act on a properly filed time extension request prior to the expiration date, the use granted under the Special Permit may be continued, unless the Planning Commission specifically disallows the activity during the interim period. (d) The petitioner shall also file a one hundred dollars publication fee, along with the original and ten copies of the request. \*(e) The hearing and notice procedures and action shall be the same as under sections 6-5 and 6-7 of this rule, provided further that the Planning Commission shall conduct a hearing within a period of sixty days from the date of receipt of a properly filed petition, or within a longer period as may be agreed to by the Planning Commission." Should you have any questions, please feel free to contact me. Sincerely, ALBERT LONG LYMAN Planning Director RN:1kt cc: W. R. Coops

### The Research Corporation of the University of Hawaii



May 20, 1986

Ms. Ilima Piianaia Deputy Director County of Hawaii 25 Aupuni Street Hilo, HI 96720

Dear Ms. Piianaia:

Following our recent meeting with you and your staff, we have developed a description of the proposed test pipeline between the Puna Geothermal Venture's KS-1A well and the HGP-A power plant. A copy of this Project Description is enclosed for your information and review.

As we mentioned during our meeting, the Research Corporation of the University of Hawaii (RCUH) expects to conclude an agreement with Thermal Power Company, as operator for the Puna Geothermal Venture (PGV), under which the operation of the HGP-A plant would be conducted by Thermal Power. This agreement has not been concluded, but is expected to be finalized in the next couple of weeks.

We believe the building of this pipeline and the conducting of the test is an extension of the research objectives for which the HGP-A plant was originally built and is a part of the exploration program designed to prove the reservoir in the Kapoho area. Accordingly, we feel that no amendments to the Special Use Permits granted to HGP-A and PGV will be required. We recognize that building permits and other administrative actions will be necessary to construct the pipeline, establish easements, etc...

We would appreciate your review of our project description. Please direct any comments or questions to the undersigned. We plan to complete our negotiations and begin building the pipeline early this summer.

Sincerely yours,

R. A. Patterson

Thermal Power Company

Research Corporation of UH

#### KS-lA to HGP-A Pipeline Project Description May 2, 1986

- 1. Purpose
- 2. Route Selection
- 3. Project Systems
- 4. Plan of Operation
- 5. Plan of Construction
- 6. Plan of Decommissioning

#### 1. Purpose

The Research Corporation of the University of Hawaii ("RCUH") as the contracting agent for the Natural Energy Laboratory of Hawaii (NELH), owner/manager of the HGP-A Plant, operates a geothermal research and demonstration plant on the Island of Hawaii. The Plant is currently operated under contract to RCUH by the Hawaii Electric Light Company, Inc. ("HELCO") under a Power Purchase and Service Agreement dated September 1, 1983, as amended March 1, 1986, which also provides for HELCO's purchase of power generated by the Plant.

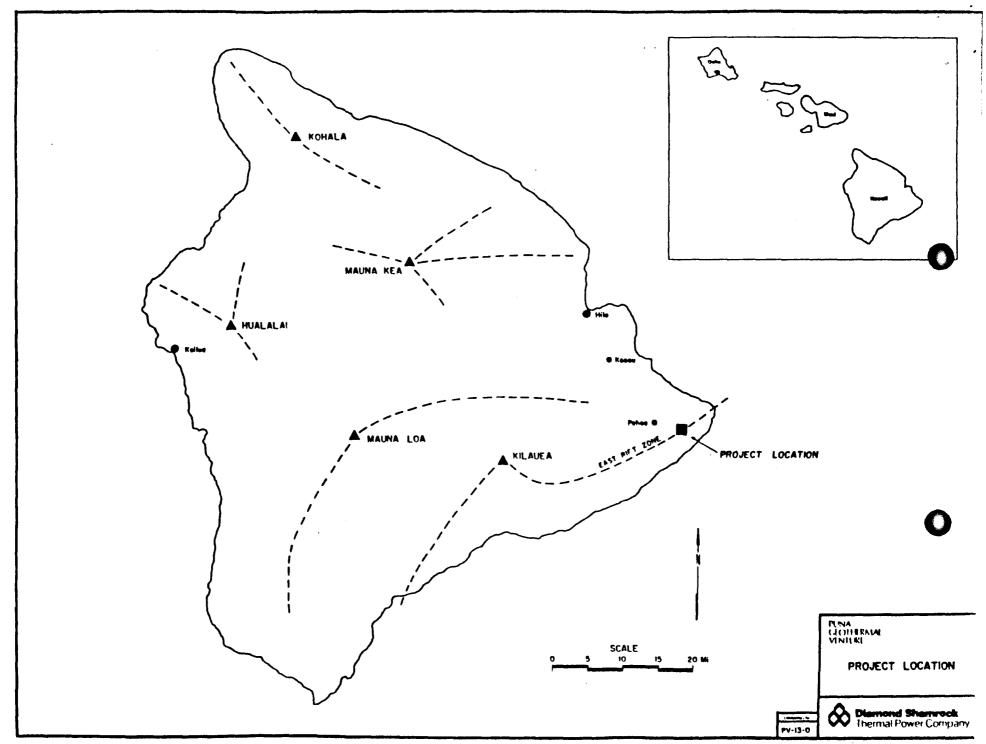
Thermal Power Company ("TPC") as Operator, has proposed that the parties to the Puna Geothermal Venture ("PGV") furnish the HGP-A Plant and Puna Resource Facility with steam and brine from their KS-lA well through construction of a pipeline system connecting the well to the Plant. In addition, an agreement would be completed with RCUH by TPC/PGV to provide for the operation of the Plant on a day-to-day basis.

This proposed long-term test arrangement is designed to enhance the quantity and reliability of the Plant's steam supply, allow needed tests and maintenance of the HPG-A well, provide additional data and information on the Puna geothermal reservoir, and perform cooperative research and development on the feasibility of geothermal energy production on the Island of Hawaii. In addition, this arrangement will provide an opportunity to test and evaluate the performance of PGV's KS-lA well as a continuation of its exploration program. The arrangement would terminate prior to the time steam is required for PGV's proposed commercial power plant.

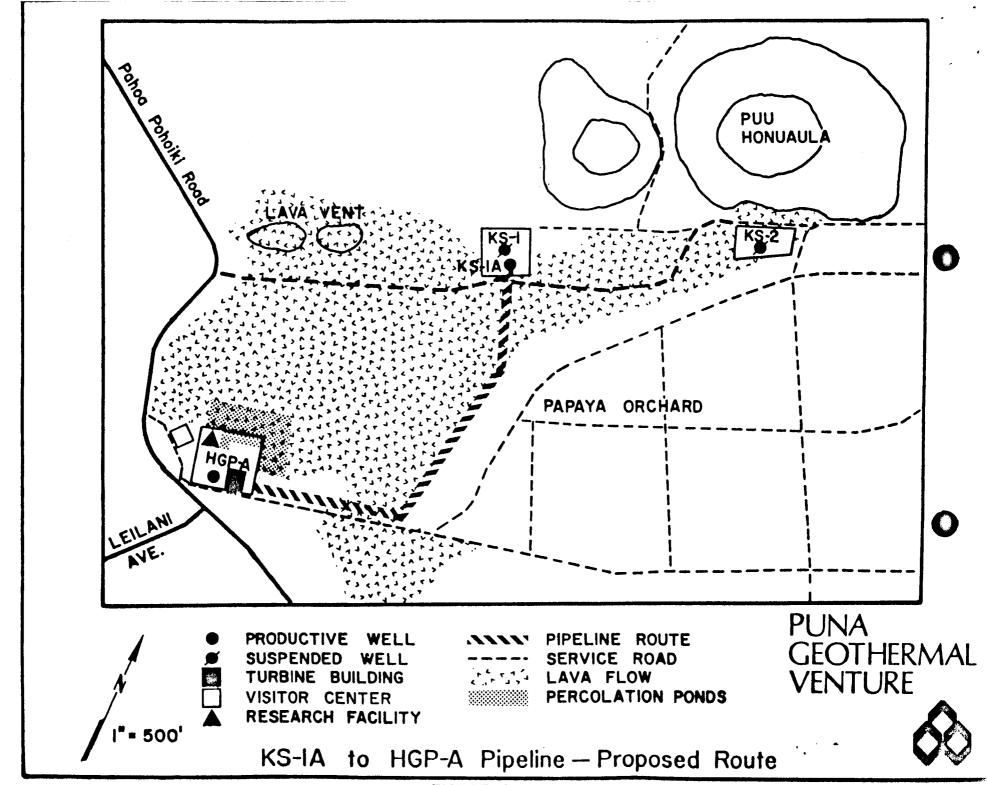
The HGP power plant and KS-lA well are located in the Puna District of Hawaii as shown in Figure 1. The 816 acre land parcel where the PGV has been conducting its exploration program, is leased to the PGV by the Kapoho Land Partnership (KLP); a ground lease with the KLP may be required for the project. The State of Hawaii owns the parcel on which the HGP-A plant and well, and the Puna Research Pacility, are located. The State of Hawaii's interests in the mineral rights under the KLP parcel have been leased for the project by State Geothermal Mining Lease R-2. All the lands are within the Kapoho Geothermal Resource Subzone.

#### 2. Route Selection

The selection of a preferred route (Figure 2) was based on several factors including terrain, distance, planned duration of the test, grading requirements, visual impacts, and layout of the HGP-A facility. The terrain is relatively flat between the two sites and covered with an uneven crust of lava from the 1955 erruption. The crust varies in thickness from 1-2 feet in some places to areas which exceed 6 feet.



Tigure 1



The preferred oute crosses a short section of relatively flat lava that requires minimal grading. It then runs between a papaya orchard and the edge of the lava flow before following an existing service road to the plant. This route minimizes the disturbance to the land while meeting the other route selection criteria.

The pipeline requires a service road for construction and maintenance purposes. As the pipeline is planned as a temporary structure, it was determined that the straight line route runs through the roughest areas of the lava flow and would require excessive grading and disturbance of the land for the service road.

An alternative route is to run the pipeline along the edge of the existing access road to the KS-l wellpad before cutting across the lava to the plant. The grading requirements for this route are somewhat reduced, but a service road would still be required, and the pipeline would cross the percolation ponds at HGP-A reducing the ability to service the ponds. Additionally, the pipeline would cause a more significant visual impact at the Visitor Center, and might also interfere with the Research Facility.

#### 3. Project Systems

### Wellpad Subsystem

The subsystem (Figure 3) begins downstream of the master shut-off valve at the KS-lA wellhead. It is designed in accordance with the American National Standards Institute (ANSI) B31.1 Power Piping Code and will include throttling and isolation valves, a rock catcher, a moisture separator, flow metering runs, remote monitoring systems, and rupture disk overpressure protection. A rock muffler and chemical abatement equipment is also provided in the unlikely event that the pipeline is unable to deliver fluids to the plant. Much of this equipment is already installed at the KS-lA site, having been used for well testing.

#### Steam Delivery Pipeline

The separator will discharge steam into a 12 inch pipeline constructed of low carbon steel, insulated, and supported above ground. The piping is designed in accordance with ANSI B31.1 Power Piping Code and engineered for stresses induced by thermal, pressure and deadload conditions. Sufficient horizontal and vertical flexibility are incorporated in the design to withstand ground movements along the rift axis.

Prior to entering the power plant, the steamline will expand to about 24 inches to reduce the velocity of the steam. Entrained moisture will drop out of the steam, to be collected in a series of water traps. This condensate will be collected and delivered

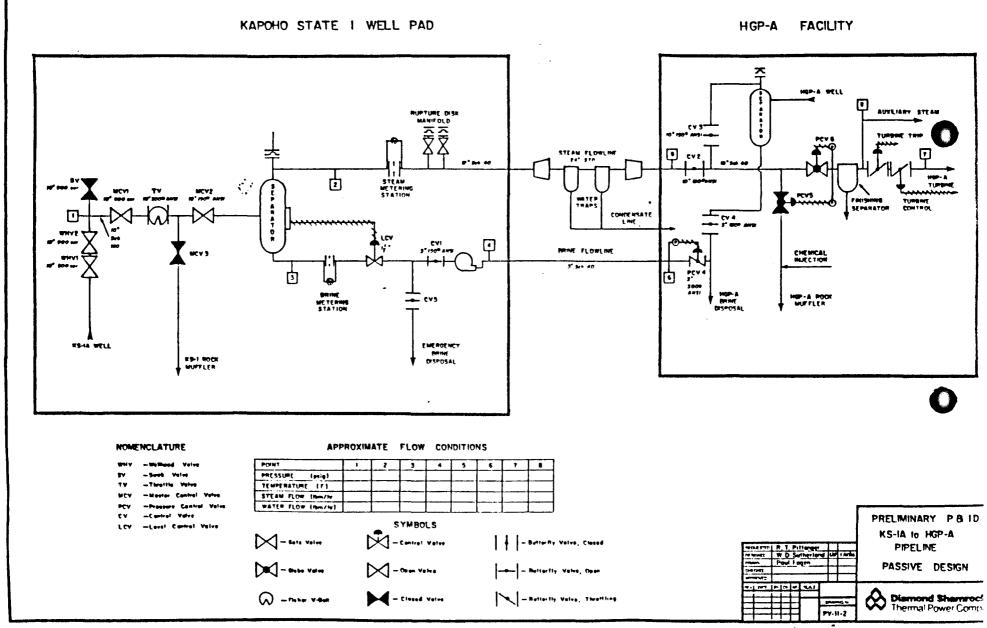


FIGURE 3

to the plant for disposal. If necessary water will be injected upstream of this section to scrub the steam clean of any silica or other minerals that may be present.

The pipeline is supported by steel pillars cemented in place and spaced about 30 feet apart or as needed to prevent sagging. The pipeline sits approximately 3-6 feet above the ground, but the actual height is determined by the terrain and other design considerations. Periodically, expansion loops are required to allow thermal expansion of the pipe. These will be kept horizontal as much as possible; however, a vertical loop is required for crossing the wellpad access road. The pipeline will be painted to blend with the surrounding environment, and vegetation will be encouraged along the route to further reduce visual impacts.

### Brine Delivery Pipeline

A 2-3 inch insulated low carbon steel pipeline will transport brine from the separator to the HGP-A site for use in the Research Facility. This pipeline will run parallel to the steam pipeline and will be supported by the same structure. If necessary, a pump will be installed to maintain pressure, helping to retard silica precipitation.

### 4. Plan of Operation

The operation of the HGP-A plant will not change significantly under the current plan. A different source will supply the geothermal fluid. The steam flow rate is expected to increase to the full capacity of the plant (approximately 55,000 lb/hr) which should increase the power output close to design levels (3MW gross). KS-lA flow test data indicates that the volume of brine will decrease to about 15,500 lb/hr., from the current 60,000 lb/hr., in spite of increased steam production. This reduced quantity of liquid will be disposed of in the percolation ponds when not required by the Research Facility. The level of H<sub>2</sub>S emissions will not rise as a result of this project; reduced brine flow may even reduce the overall H<sub>2</sub>S emissions at the facility.

The wellpad and pipeline systems are designed to operate without the presence of an operator. The system is passive except for a level control valve on the separator. During normal operation, the system will only require periodic inspection of the flow metering system or adjustments to the throttling valve. Appropriate staff will be available at the HGP-A plant for these tasks.

The steam and brine will be supplied to the HGP-A plant on a continuous basis. The response to a turbine trip at the plant will not change from the current method, where steam is chemically

abated with caustic soda (NaOH) and received through the rock muffler at the HGP-A facility. If the steam cannot be delivered to the plant it will be chemically abated and released through the rock muffler on the KS-lA wellpad or the well will be shut in.

### 5. Plan of Construction

Total construction time for the pipeline is estimated to be 4 months after the start of site development activities. The estimated employment of the site during construction is 15 persons. Work will be accomplished, almost exclusively, by local contractors and the local labor force. All work is anticipated to occur during daylight hours. At the end of construction, surplus materials and waste will be removed from the site or stored.

### 6. Plan for Decommissioning

When no longer required, the pipeline and supports will be removed. The roadway will be abandoned to the extent agreed upon with the landowner, and, if necessary, the area will be seeded or planted with natural vegetation.

Mr. Ralph Patterson Project Manager Thermal Power Company 220 South King St., Suite 1750 Honolulu, Hawaii 96813

Dear Mr. Patterson:

The Department of Land and Natural Resources acknowledges the receipt of your Project Description for the proposed test pipeline between Kapoho State 1-A (KS 1-A) and the HGP-A power plant facility.

Pursuant to the Department's Administrative Rules on "Leasing and Drilling of Geothermal Resources" and the provisions of State mining leases R-2 and S-4602, please provide the following additional information pertinent to our review of your proposal.

1) Geothermal Resource Mining Lease R-2 specifically provides for the payment of a royalty of ten (10) percent of the gross proceeds received by the Lessee from the sale or use of geothermal resources.

Per your contention that the payment of royalties will not be required, please submit an explanation of how revenues generated from the sale of electricity will be allocated. The payment schedule should describe the proposed distribution of revenue used for the operation and maintenance of the plant/pipeline, monthly pipeline amortization payments and the apportionment of any remaining balance to Puna Geothermal Venture (PGV) and the Natural Energy Laboratory of Hawaii (NELH).

Pursuant to item (1) above and the provision of the lease requiring the filing of a construction bond for a sum of not less than one hundred (100) percent of the cost of the pipeline, please provide our department an estimate of the pipeline construction costs.

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- 3) Should the royalty be temporarily waived by the Board of Land and Natural Resources (HLNR) on the basis that the pipeline project is for testing purposes, can the testing program be successfully completed within 6 to 9 months of operation?
  - If not, please provide a specific testing program and explanation describing the need for a longer testing period.
- What are the future plans for the HGP-A well and what type of well maintenance will be conducted? Furthermore, will the HGP-A well be used for production purposes again once the testing arrangement between both parties has terminated?
- 5) Has the ownership of the HGP-A equipment been transferred from the U.S. Department of Energy to NELH? If not, will the pipeline project require DOE approval for use of their equipment?
- 6) Can HGP-A's existing DOW abatement system accommodate the H<sub>2</sub>S levels expected in the steam phase from KS 1-A?
  In your response, please provide current H<sub>2</sub>S data from the HGP-A well as compared to the levels found at KS 1-A.
- 7) Is the use of a rupture disk overpressure protection device as proposed, better than the use of conventional relief valves that re-close when pressure has subsided? What procedures will be followed should a rupture disc blow-out occur and how will the steam be diverted?
- Per the project description, the pipeline and supports will be dismantled and removed upon completion of testing. Is there a possibility of using the HGP-A well to supply steam through the pipeline to the future PGV power plant as previously discussed?

In addition to submitting an amended Plan of Operation for approval by the Chairperson, the following provisions of leases R-2 and S-4602 may require approval by the Board of Land and Natural Resources:

- a) The granting by Lessor (BLNR) of such easements or rights-of-way for joint or several use upon, through or in the leased area for steam lines.
- b) Lessor's approval of production equipment, metering systems, and pipelines or roads for the production, sale or use of geothermal resources.

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Andrew Herman der Gertrag in der William der Schalle der Schalle der Schalle der Schalle der Schalle der Schal Der Schalle der Schalle der Gertrag in der Schalle de c) The Lessor and any other state agency having jurisdiction over the affected lands shall also approve the place and manner of waste disposal. The continued use of percolation ponds for the disposal of brine from KS 1-A shall also require approval from the Department of Health.

A Designation of Operator is required where mining operations are to be conducted under an approved operating agreement or assignment, and shall be submitted to the Chairperson prior to commencement of operations.

The approval of the proposed pipeline project shall also be subject to the applicant's receipt of the appropriate land use permit from the County of Hawaii. In anticipation of the Planning Commission's adoption of Rule 12 concerning Geothermal Resource Permits, the applicant shall submit copies of the approved permits and all other applicable approvals from other county, state or federal agencies.

Thank you for the opportunity to review your project description. The Department would appreciate your reply to our questions and comments prior to your submittal of any proposed amendments to the existing Plan of Operations.

Should you have any questions or if you would like to schedule another meeting, please feel free to contact me at 548-7533.

Sincerely,

MANABU TAGOMORI Manager-Chief Engineer

DN:ko

May 29, 1986

#### MEMORANDUM FOR THE RECORD

FROM:

Dean Nakano

SUBJECT:

Proposal to Utilize the HGP-A Facility for Long Term Testing of Geothermal Well Kapoho State No. 1-A

On April 22, 1986, a meeting was held at the DOWALD conference room to discuss the proposed project between Puna Geothermal Venture and the Natural Energy Laboratory of Hawaii concerning long term flow testing of Kapoho State No. 1-A.

In attendance were the following people:

Tak Yoshihara DPED
Jack Huizingh NELH
William Coops RCUH
Ralph Patterson Thermal Power Co.

Manabu Tagomori DOWALD
Dean Nakano DOWALD

The proposal presented by Mr. Patterson is outlined below:

- 1) Shut-in the HGP-A well and utilize steam from Kapoho State No. 1-A (K.S. 1-A) to run the HGP-A generator facility.
- 2) Conduct long term flow tests of K.S. 1-A for a period of 6 months to 3 years.
  - a) Length of the testing period will be dependent upon the completion of the planned PGV power plant.
  - b) The initial 12.5 MW plant is scheduled for completion sometime in late 1989 or early 1990.
  - c) The second 12.5 MW plant is planned for completion in 1992.
- 3) Separate the 2-phase liquid dominated steam at the K.S. 1-A well site.
  - a) Transport the steam and brine through 2 separate pipelines to the HGP-A facility.

- b) Construct approximately 1800 feet of pipeline, using a 24-inch diameter pipeline for steam and a smaller diameter pipeline for the brine.
- c) Completion of the pipeline within 6 to 8 weeks from the start of construction, currently scheduled for July 1986.
- d) The major portion of the pipeline could be built next to the existing cut roadway leading to the site of K.S. 1-A.
- e) The pipeline would utilize expansion loops to allow for thermal expansion and be supported by concrete pedestals.
- f) Cost of the pipeline is estimated at \$800,000.
- 4) The project would require NELH to enter into an agreement with PGV to serve as operator of the HGP-A facility and be responsible for plant maintenance.
- 5) PGV would provide the steam from K.S. 1-A at no cost, in exchange for use of the HGP-A facility for long term flow tests.
  - a) All test data collected from the pipeline section through the power plant facility would be made public.
  - b) Down-hole data from the well shall remain confidential.
  - c) Testing will check for H<sub>2</sub>S partitioning, decline in steam flow, and shall include research into brine chemistry and disposal.
  - d) Brine from K.S. 1-A will be utilized at the Puna Research Center for the new direct-heat laboratory.
- 6) Starting date of operation is scheduled for October 1, 1986.
- 7) Revenue generated from the sale of electricity to HELCO, shall be distributed in the following order:
  - a) First, to pay for any costs required to maintain the HGP-A facility.
  - b) Second, to pay for the cost of the pipeline, amortized over 4 years.

- c) Last, should any surplus remain, 90% of the revenue balance would go to NELH and 10% to PGV.
- 8) Plans for the HGP-A well, if it were shut down are still pending.
  - a) The HGP-A well may be re-conditioned for continued use by the existing facility, or to provide additional steam for the future PGV power plant.
  - b) Other options include non-electrical uses, use as a re-injection well or total abandonment.
  - c) Should the HGP-A well be shut-in, data indicates that it could take up to 6 months to start up the well again.
- 9) Plans for the HGP-A generator facility are also pending.
  - a) The facility itself is not commercially saleable and may be shut down and used for spare parts.
- 10) The HGP-A facility is currently producing 2.2 MW of electricity down from the initial 2.8 MW generated.
  - a) Steam production has decreased 2-3% per year and the chemistry of the well has changed.
- 11) Initial flow test data from K.S. 1-A indicates that it has more steam than HGP-A and could possibly generate up to 3.2 MW of electricity.
  - a) Current brine output from K.S.1-A is approximately 15,000 lb/hr versus 50,000 lb/hr at HGP-A.
  - b) Use of Lanipuna No. 6 for re-injection purposes is still being considered by PGV. Costs to convert the well is estimated at \$1,000,000.
- 12) The other alternatives to the pipeline project would be to properly plug K.S. 1-A until the power plant is built, or to leave the well in its current shut-in condition and conduct periodic venting with abatement.
  - a) Data indicates that K.S. 1-A may be experiencing some corrosion problems within the well bore.

Mr. Patterson concluded his oral presentation and stated that a written proposal would be forwarded to DLNR and the County of Hawaii.

Memo for the Record May 29, 1986 Mr. Tagomori advised the group that an amended Plan of Operation would be needed for the project, and that the proposal may require review by the Attorney General's office concerning the payment of royalties as provided under the existing mining lease GRML R-2. Mr. Coops stated that the proposed project would retain its experimental status and should not be treated as a commercial venture. An organizational chart showing the relationship between the parties involved is attached for your reference. DEAN NAKANO DN:ko

RECEIVED

86 MAY 30 P2: 05

The Research Corporation of the University of Hawaii

DIV. OF WATER & LAND DEVELOPMENT

May 29, 1986

Mr. Manabu Tagomori
Department of Land and
Natural Resources
1151 Punchbowl Street, #227
Honolulu, HI 96813

Dear Mr. Tagomori:

Following our recent meeting with you and your staff, we have developed a description of the proposed test pipeline between the Puna Geothermal Venture's KS-1A well and the HGP-A power plant. A copy of this Project Description is enclosed for your information and review.

As we mentioned during our meeting, the Research Corporation of the University of Hawaii (RCUH) expects to conclude an agreement with Thermal Power Company, as operator for the Puna Geothermal Venture (PGV), under which the operation of the HGP-A plant would be conducted by Thermal power. This agreement has not been concluded, but is expected to be finalized in the next couple of weeks.

We believe building of this pipeline and the conducting of the test is an extension of the research objectives for which the HGP-A plant was originally built and is a part of the exploration program designed to prove the reservoir in the Kapoho area. There will be no sale of the steam although a monthly pipeline amortization payment will be paid to PGV out of the revenues received by RCUH for the electricty. Thus, we believe that no royalties will be required under the terms of State mining leases R-2 and S-4602.

It is recognized that amendments to the approved Plan of Operations will be necessary under the DLNR Rules on Leasing and Drilling of Geothermal Resources (Chapter 183 of Title 13, Administrative Rules). Amendments necessary will be prepared and submitted in the next few weeks, after discussions with your staff.

Mr. Manabu Tagomori Page 2 May 29, 1986

We would appreciate your review of our project description. Please direct any comments or questions to the undersigned. We plan to complete our negotiations and begin building the pipeline early this summer.

Sincerely,

William R. Coops Research Corporation of the University of Hawaii

R. A. Patterson

Thermal Power Company

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**Enclosures** 

# KS-lA to HGP-A Pipeline Project Description May 2, 1986

- 1. Purpose
- 2. Route Selection
- 3. Project Systems
- 4. Plan of Operation
- 5. Plan of Construction
- 6. Plan of Decommissioning

#### 1. Purpose

The Research Corporation of the University of Hawaii ("RCUH") as the contracting agent for the Natural Energy Laboratory of Hawaii (NELH), owner/manager of the HGP-A Plant, operates a geothermal research and demonstration plant on the Island of Hawaii. The Plant is currently operated under contract to RCUH by the Hawaii Electric Light Company, Inc. ("HELCO") under a Power Purchase and Service Agreement dated September 1, 1983, as amended March 1, 1986, which also provides for HELCO's purchase of power generated by the Plant.

Thermal Power Company ("TPC") as Operator, has proposed that the parties to the Puna Geothermal Venture ("PGV") furnish the HGP-A Plant and Puna Resource Facility with steam and brine from their KS-lA well through construction of a pipeline system connecting the well to the Plant. In addition, an agreement would be completed with RCUH by TPC/PGV to provide for the operation of the Plant on a day-to-day basis.

This proposed long-term test arrangement is designed to enhance the quantity and reliability of the Plant's steam supply, allow needed tests and maintenance of the HPG-A well, provide additional data and information on the Puna geothermal reservoir, and perform cooperative research and development on the feasibility of geothermal energy production on the Island of Hawaii. In addition, this arrangement will provide an opportunity to test and evaluate the performance of PGV's KS-IA well as a continuation of its exploration program. The arrangement would terminate prior to the time steam is required for PGV's proposed commercial power plant.

The HGP power plant and KS-lA well are located in the Puna District of Hawaii as shown in Figure 1. The 816 acre land parcel where the PGV has been conducting its exploration program, is leased to the PGV by the Kapoho Land Partnership (KLP); a ground lease with the KLP may be required for the project. The State of Hawaii owns the parcel on which the HGP-A plant and well, and the Puna Research Facility, are located. The State of Hawaii's interests in the mineral rights under the KLP parcel have been leased for the project by State Geothermal Mining Lease R-2. All the lands are within the Kapoho Geothermal Resource Subzone.

## 2. Route Selection

The selection of a preferred route (Figure 2) was based on several factors including terrain, distance, planned duration of the test, grading requirements, visual impacts, and layout of the HGP-A facility. The terrain is relatively flat between the two sites and covered with an uneven crust of lava from the 1955 erruption. The crust varies in thickness from 1-2 feet in some places to areas which exceed 6 feet.

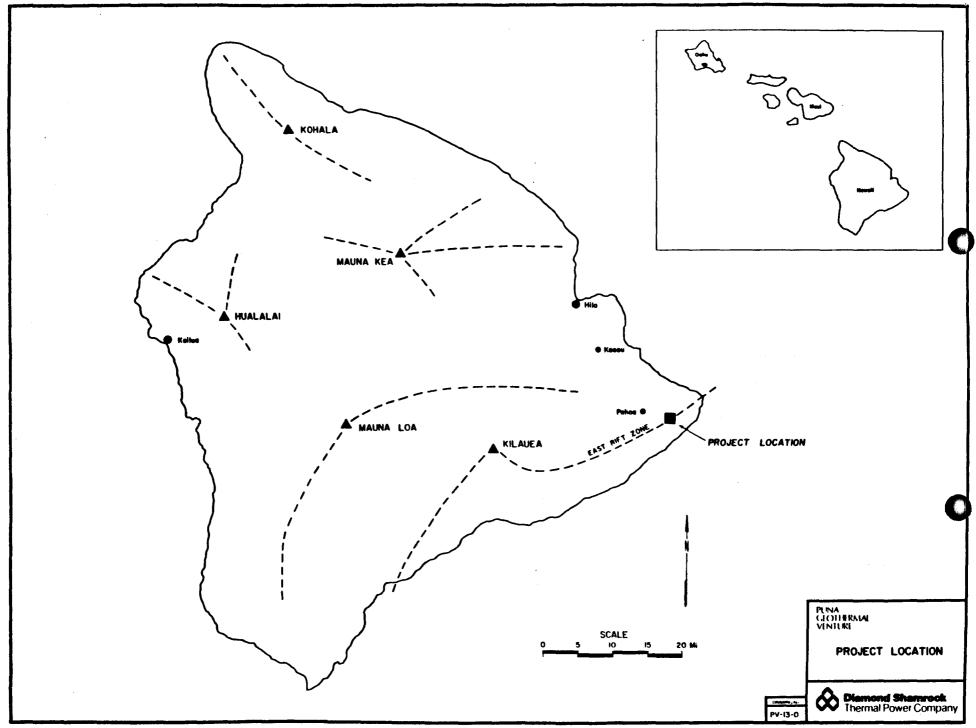
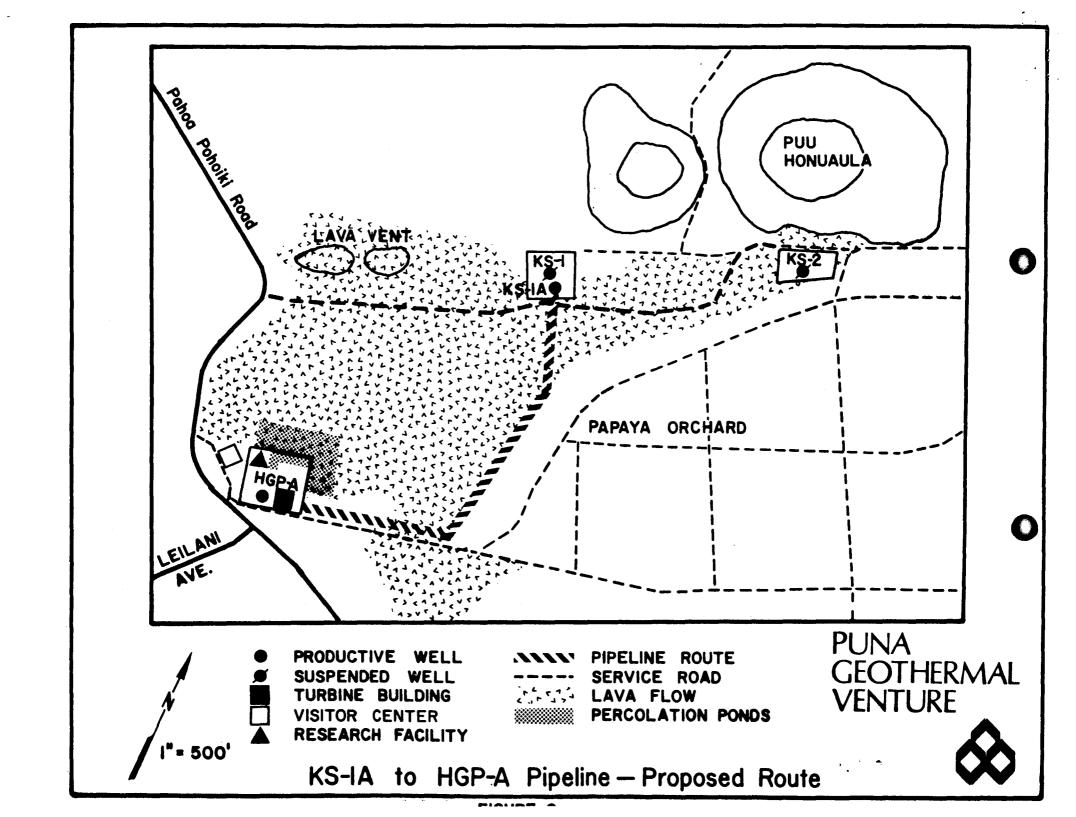


Figure 1



The preferred route crosses a short section of relatively flat lava that requires minimal grading. It then runs between a papaya orchard and the edge of the lava flow before following an existing service road to the plant. This route minimizes the disturbance to the land while meeting the other route selection criteria.

The pipeline requires a service road for construction and maintenance purposes. As the pipeline is planned as a temporary structure, it was determined that the straight line route runs through the roughest areas of the lava flow and would require excessive grading and disturbance of the land for the service road.

An alternative route is to run the pipeline along the edge of the existing access road to the KS-1 wellpad before cutting across the lava to the plant. The grading requirements for this route are somewhat reduced, but a service road would still be required, and the pipeline would cross the percolation ponds at HGP-A reducing the ability to service the ponds. Additionally, the pipeline would cause a more significant visual impact at the Visitor Center, and might also interfere with the Research Facility.

#### 3. Project Systems

#### Wellpad Subsystem

The subsystem (Figure 3) begins downstream of the master shut-off valve at the KS-lA wellhead. It is designed in accordance with the American National Standards Institute (ANSI) B31.1 Power Piping Code and will include throttling and isolation valves, a rock catcher, a moisture separator, flow metering runs, remote monitoring systems, and rupture disk overpressure protection. A rock muffler and chemical abatement equipment is also provided in the unlikely event that the pipeline is unable to deliver fluids to the plant. Much of this equipment is already installed at the KS-lA site, having been used for well testing.

#### Steam Delivery Pipeline

The separator will discharge steam into a 12 inch pipeline constructed of low carbon steel, insulated, and supported above ground. The piping is designed in accordance with ANSI B31.1 Power Piping Code and engineered for stresses induced by thermal, pressure and deadload conditions. Sufficient horizontal and vertical flexibility are incorporated in the design to withstand ground movements along the rift axis.

Prior to entering the power plant, the steamline will expand to about 24 inches to reduce the velocity of the steam. Entrained moisture will drop out of the steam, to be collected in a series of water traps. This condensate will be collected and delivered

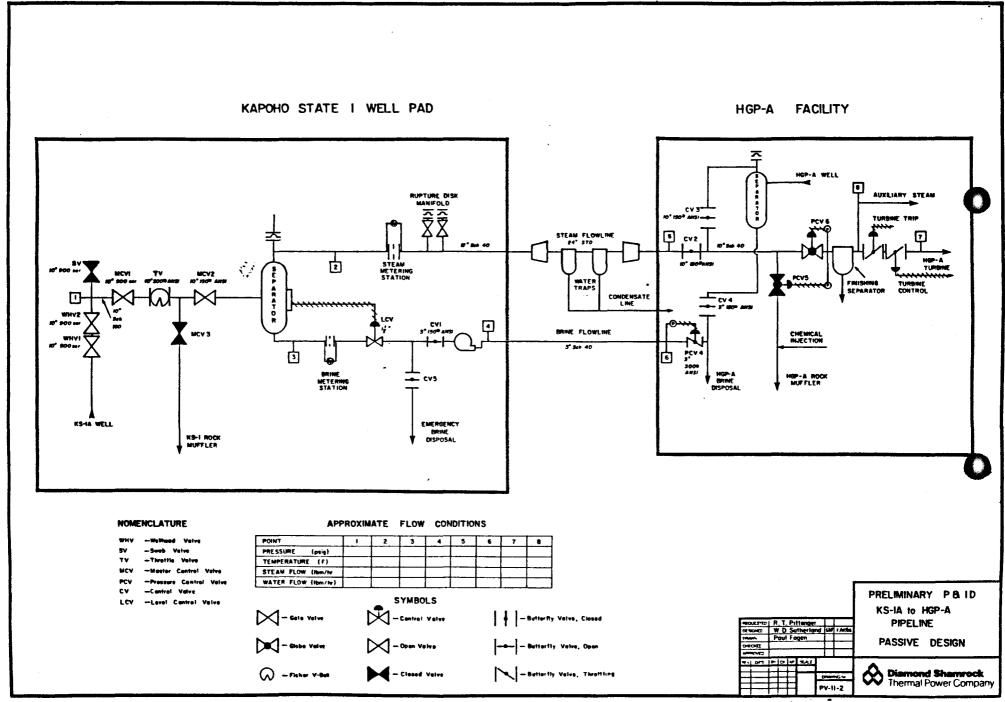


FIGURE 3

to the plant for disposal. If necessary, water will be injected upstream of this section to scrub the steam clean of any silica or other minerals that may be present.

The pipeline is supported by steel pillars cemented in place and spaced about 30 feet apart or as needed to prevent sagging. The pipeline sits approximately 3-6 feet above the ground, but the actual height is determined by the terrain and other design considerations. Periodically, expansion loops are required to allow thermal expansion of the pipe. These will be kept horizontal as much as possible; however, a vertical loop is required for crossing the wellpad access road. The pipeline will be painted to blend with the surrounding environment, and vegetation will be encouraged along the route to further reduce visual impacts.

### Brine Delivery Pipeline

A 2-3 inch insulated low carbon steel pipeline will transport brine from the separator to the HGP-A site for use in the Research Facility. This pipeline will run parallel to the steam pipeline and will be supported by the same structure. If necessary, a pump will be installed to maintain pressure, helping to retard silica precipitation.

### 4. Plan of Operation

The operation of the HGP-A plant will not change significantly under the current plan. A different source will supply the geothermal fluid. The steam flow rate is expected to increase to the full capacity of the plant (approximately 55,000 lb/hr) which should increase the power output close to design levels (3MW gross). KS-lA flow test data indicates that the volume of brine will decrease to about 15,500 lb/hr., from the current 60,000 lb/hr., in spite of increased steam production. This reduced quantity of liquid will be disposed of in the percolation ponds when not required by the Research Facility. The level of H<sub>2</sub>S emissions will not rise as a result of this project; reduced brine flow may even reduce the overall H<sub>2</sub>S emissions at the facility.

The wellpad and pipeline systems are designed to operate without the presence of an operator. The system is passive except for a level control valve on the separator. During normal operation, the system will only require periodic inspection of the flow metering system or adjustments to the throttling valve. Appropriate staff will be available at the HGP-A plant for these tasks.

The steam and brine will be supplied to the HGP-A plant on a continuous basis. The response to a turbine trip at the plant will not change from the current method, where steam is chemically

abated with caustic soda (NaOH) and released through the rock muffler at the HGP-A facility. If the steam cannot be delivered to the plant it will be chemically abated and released through the rock muffler on the KS-lA wellpad or the well will be shut in.

### 5. Plan of Construction

Total construction time for the pipeline is estimated to be 4 months after the start of site development activities. The estimated employment of the site during construction is 15 persons. Work will be accomplished, almost exclusively, by local contractors and the local labor force. All work is anticipated to occur during daylight hours. At the end of construction, surplus materials and waste will be removed from the site or stored.

# 6. Plan for Decommissioning

When no longer required, the pipeline and supports will be removed. The roadway will be abandoned to the extent agreed upon with the landowner, and, if necessary, the area will be seeded or planted with natural vegetation.