

- b) Complete upset of the geothermal fluid injection system;
  - c) Pressure in the steam lines exceeds safety design set points; or
  - d) Any upset situation which would otherwise result in a release of unabated steam to the atmosphere.
12. The emergency steam release facility shall be equipped and maintained at all times with a minimum three-day operating storage capacity of sodium hydroxide. The chemical abatement system shall operate automatically when steam is released through the rock muffler(s). The hydrogen sulfide concentrations shall be continuously monitored both downstream and upstream of the chemical injection point. A sodium hydroxide treatment mole ratio of 4 to 1 (NaOH/H<sub>2</sub>S) will be used initially and the abatement efficiency monitored. The optimum mole ratios will be determined during the hydrogen sulfide abatement operations.
- Upon utilizing the emergency steam release facility, the permittee shall take immediate action to the extent practical to reduce the steam flow and perform the necessary corrective actions. The steam flow rate shall be reduced, as a minimum, to 50 percent of full flow within four (4) hours after initiating the use of the emergency steam release facility.
13. The permittee shall immediately notify the Department of Health of any operational upsets, equipment failure or malfunction which would allow an increase in the emissions of hydrogen sulfide, particulate matter or isopentane. In addition, a written report shall be submitted to the Department of Health within five (5) days of the occurrence. The report shall include a description of the malfunctioning equipment or abnormal operation, the date of the initial failure, the estimated resultant emissions, time and duration of the event, and the methods utilized to restore normal operations. Compliance with this notification provision shall not excuse or otherwise constitute a defense for any violation(s) of this permit, law, rule or order which results from the operational upset, equipment failure or malfunction.
14. The permittee shall maintain a 24-hour telephone service to accept calls concerning this Authority to Construct. This telephone number must be fully operational prior to commencement of construction.
15. Should any of the air quality monitoring stations indicate an ambient hydrogen sulfide, one-hour average concentration greater than 100 ppb, the permittee shall take immediate action to the extent practical to reduce all power plant emissions. Within four (4) hours of the exceedance, the permittee shall terminate all power plant activities not associated with normal power plant operations and contributing to hydrogen sulfide emissions. Following the reduction in project emissions, if the monitoring stations still indicate ambient hydrogen sulfide concentrations in excess of 100 ppb (one-hour average), the permittee shall curtail the power plant operations, unless the permittee can conclusively show to the Department of Health that the project operations and emissions are not contributing any impact to monitoring site. If the ambient hydrogen sulfide concentration is below 100 ppb (one-hour average) after the project emissions have been reduced, the permittee shall maintain the emissions at

this reduced level until such time the Department of Health is assured that the resumption of full activity shall not result in another exceedance of the ambient level of 100 ppb (one-hour average).

The permittee shall submit a written report to the Department of Health within two (2) days of the occurrence. The report shall include the date, time and duration of the exceedance, the estimated project emissions and any other emission sources that may have contributed to the exceedance, and all corrective measures and actions taken to reduce project emissions to a minimum. Compliance with this notification provision shall not excuse or otherwise constitute a defense for any violation(s) of this permit, law, rule or order.

16. The operation of the 25 MW geothermal power plant during periods of operational upsets, equipment failure or malfunctions shall not cause or contribute to an exceedance of the hydrogen sulfide ambient level of 100 ppb on a one-hour average at or beyond the project boundary.
17. During those periods of normal power plant and wellfield operation, the combined emissions of hydrogen sulfide from the 25 MW geothermal power plant and associated wellfield shall not cause an increase in the ambient hydrogen sulfide concentrations in excess of 5 ppb (one-hour average) above background at or beyond the project boundary. During those periods when geothermal well drilling, well flow testing, or emergency steam release may be occurring, whether separately, in any combination, or whether in combination with periods of normal power plant or wellfield operation, the combined emissions of hydrogen sulfide from these sources shall not cause an increase in the ambient hydrogen sulfide concentration in excess of 25 ppb (one-hour average) above background at or beyond the project boundary.
18. For any ambient hydrogen sulfide concentrations in excess of 5 ppb (one-hour average) above background as indicated by any air quality monitoring station, the permittee has the burden of proving that operation of the 25 MW geothermal power plant and wellfield did not cause the hydrogen sulfide impact in excess of 5 ppb (one-hour average), or proving that the power plant or wellfield had experienced an operational upset, equipment failure, malfunction or as otherwise not operating normally. For any ambient hydrogen sulfide concentration in excess of 25 ppb (one-hour average) above background as indicated by any air quality monitoring station, the permittee has the burden of proving that operation of the 25 MW geothermal power plant and wellfield did not cause the hydrogen sulfide concentration in excess of 25 ppb (one-hour average), or proving that the measured impact occurred during the vertical venting of a geothermal well or cleanout of the steam production pipelines.
19. During normal power plant operations, the hydrogen sulfide emissions from the 25 MW geothermal power plant shall not exceed one pound per hour (three-hour average). During periods of malfunction or regularly scheduled maintenance, best available control technology shall be applied for the hydrogen sulfide emissions.
20. The Department of Health may at any time with reasonable cause, request the permittee to install, operate, and maintain emission monitors to continuously measure

ATTACHMENT II ATC NO. A-834-796  
POWER PLANT  
Page 5

and record the hydrogen sulfide and isopentane emissions at any specified location in the power plant.

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

July 17, 1992

92-A481

Mr. Steven E. Morris  
Vice President and General Manager  
Puna Geothermal Venture  
101 Aupuni Street, Suite 1014-B  
Hilo, Hawaii 96720

Dear Mr. Morris:

Subject: Authority to Construct (ATC) No. A-833-795  
Permit Modification and Compilation  
Fourteen (14) Geothermal Exploratory/Developmental Wells  
Located at TMK: 1-4-01:2, 1-4-01:3, 1-4-01:5B and 1-4-01:19,  
Kilauea Lower East Rift Zone, Puna, Hawaii


The Department of Health, in accordance with the requirements of Chapter 91, Hawaii Revised Statutes (HRS), amended and compiled Chapters 11-59 and 11-60, Hawaii Administrative Rules (HAR). These rules, among other things, amended the State's air quality rules, and became effective on June 29, 1992.

Special condition number 1 of Authority to Construct (ATC) No. A-833-795 specifically notes that the ATC may be revised to conform to the State's air quality rules. Pursuant to special condition number 1 (as well as Chapter 342B, HRS, and Chapters 11-59 and 11-60, HAR), the Department of Health has consolidated the prior permit changes and made additional minor revisions to ATC No. A-833-795 to conform to our most recent amendments to the State's air quality rules.

Enclosed with this letter are Attachments I and II. The conditions set forth in Attachments I and II supersede in their entirety the conditions issued with ATC No. A-833-795 dated February 6, 1990, and as modified on March 16, 1990, May 28, 1991, and January 13, 1992.

These modifications shall become final twenty (20) days after receipt, unless before the twenty (20) days expire, Puna Geothermal Venture submits a written statement to the Director of Health either waiving its right to a hearing or requesting a hearing pursuant to Chapter 91 and Chapter 342B, HRS. If a hearing is requested, it will be held at a date, time, and place to be specified later and conducted in accordance with Chapter 91, HRS, and the Rules of Practice and Procedure of the Department of Health.

Very truly yours,

  
JOHN C. LEWIN, M.D.  
Director of Health

Enclosures  
c: DHSA, Hawaii

**ATTACHMENT I. STANDARD CONDITIONS OF AUTHORITY TO CONSTRUCT, NO. A-833-795  
APPLICATION NO. A-833  
WELLFIELD**

**Modified and Compiled: July 17, 1992**

This permit is granted in accordance with the State of Hawaii Administrative Rules, Title 11, Chapter 60, Air Pollution Control, and is subject to the following standard conditions:

1. This permit is non-transferable from person to person, from place to place, or from one piece of equipment to another.
2. This permit is automatically void if construction has not begun within one year of the date of issuance or if the work involved is suspended for one year or more.
3. This permit is automatically void when the Permit to Operate is issued or denied for all fourteen (14) exploratory/developmental wells.
4. The facility covered by this permit shall be constructed as specified in the application for Authority to Construct. There shall be no deviation unless additional or revised plans are submitted to and approved by the Department.
5. This permit is not a guarantee that the facility will receive a Permit to Operate at the end of the construction period, nor does it absolve the holder from the responsibility for the consequences of non-compliance with all Rules, Regulations, and Orders of the Department.
6. This authority, (a) shall not in any manner affect the title of the premises upon which the equipment is to be located, (b) does not release the permittee from any liability for any loss due to personal injury or property damage caused by, resulting from or arising out of the design, installation, maintenance, or operation of the proposed equipment, (c) does not release the permittee from compliance with other applicable statutes of the State of Hawaii, or with applicable local laws, regulations, or ordinances, and (d) in no manner implies or suggests that the Department, or its officers, agents, or employees, assumes any liability, directly or indirectly, for any loss due to personal injury or property damage caused by, resulting from or arising out of the design, installation, maintenance, or operation of the proposed equipment.
7. The Department is to be notified promptly in writing upon completion of the construction or installation of any equipment for which an Authority to Construct has been issued.

**ATTACHMENT II. SPECIAL CONDITIONS OF AUTHORITY TO CONSTRUCT, NO. A-833-795  
APPLICATION NO. A-833  
WELLFIELD**

**Modified and Compiled: July 17, 1992**

In addition to the standard conditions of the Authority to Construct, this permit is subject to the following special conditions:

1. The permit conditions prescribed herein may at any time be revised by the Department of Health to conform to any Federal or State promulgated air quality rules on geothermal facilities.
2. This Authority to Construct is for fourteen (14) geothermal exploratory/developmental wells to be drilled in TMK: 1-4-01:2, 1-4-01:3, 1-4-01:58 and 1-4-01:19, Kilauea Lower East Rift Zone, Puna, Hawaii. Written notification must be submitted to and approval obtained from the Department of Health prior to the commencement of construction of each well. The Department of Health shall act on the approval in a timely manner provided all required and requested information have been submitted. Each notification shall include a drawing identifying the well location, the property boundary, access roads approaching and traversing the property, the location of the nearest residence, and the locations of the air quality monitoring stations. The status of all previous constructed wells shall be provided including a clear description of the measures taken to shut-in the well. Additional information may be requested of the permittee.
3. The permittee shall obtain a Permit to Operate prior to any well approved under this permit being connected to and becoming a part of a distribution system which supplies geothermal resource to a power plant or facility, or prior to any well being used as an injection well for the geothermal resource. Additional permit conditions may be included in the Permit to Operate.
4. No geothermal exploratory/developmental wells shall be located within 600 feet of the property boundary. If any federal, state or county permit or order stipulates a distance greater than 600 feet in which no geothermal wells can be located, the greater distance shall so apply.
5. The permittee shall install, operate, and maintain a minimum of three (3) meteorological monitoring stations, three (3) ambient air quality monitoring stations for hydrogen sulfide and one (1)  $PM_{10}$  monitor. The monitoring stations required in any permit for the 25 MW power plant may be used towards fulfilling this requirement.

Prior to the commencement of construction of each well, the permittee shall submit the siting of the meteorological and air quality monitoring stations for the Department of Health's approval. The permittee shall include with the siting locations a list of the monitoring equipment installed at each station and any anticipated modifications. As a minimum, two ambient air quality monitoring stations for hydrogen sulfide and one meteorological monitoring station shall be fully operational prior to commencement of drilling operations. All three meteorological monitoring stations, three ambient air quality monitoring stations for hydrogen sulfide and the one  $PM_{10}$  monitor shall be installed and fully operational on or

before August 15, 1992. The permittee shall maintain a file of all measurements, including the monitoring system performance evaluations; calibration checks; and adjustments and maintenance performed on the system or devices. The measured data shall meet U.S. EPA capture requirements and quality assurance guidelines. At a minimum, a quality assurance check shall be conducted on each monitoring station every-other-day.

The air quality monitors shall be equipped with an alarm system or an acceptable equivalent system that is designed to page and notify the permittee or a governmental agency on a twenty-four hour basis of ambient hydrogen sulfide concentrations in excess of 10 ppb on a twenty-four-hour rolling average and 25 ppb on a one-hour average. The permittee shall immediately notify the Department of Health and the Hilo District Health Office of any exceedance above 10 ppb on a twenty-four-hour rolling average and 25 ppb on a one-hour average.

Two (2) copies of the data file in a format acceptable to the Department of Health shall be submitted on an annual basis. The data file shall be in a format that can be utilized by a personal computer for ready extraction of data. The air quality and meteorological data shall be summarized and submitted monthly in writing to the Department of Health. Additional information on the monitoring stations and on the data collected shall be submitted upon request by the Department of Health.

6. At the discretion of the Director of Health, the permittee may at any time be required to install, operate, and maintain additional air quality and meteorological monitoring stations, but only after due notice to the permittee on the reasons for the proposed change and providing the permittee an opportunity to respond within seven (7) days.
7. The permittee shall notify the Department of Health in writing at least two (2) working days prior to the commencement, and within two (2) working days after the completion of the drilling, abated well cleanout, and flow testing operations, for each geothermal well.
8. Upon completion of flow testing operations, each geothermal well shall be shut-in or otherwise prevented from discharging to the atmosphere in accordance with appropriate standards of operation and maintenance and at no time be placed on continuous or standby bleed status.
9. Flaring of excess hydrogen sulfide gas from the completed wells is prohibited without the approval of the Department of Health. If flaring of the excess gas is considered necessary, the permittee must submit a written request to the Department of Health which shall include as a minimum the proposed date, time and approximate duration of the flaring episode, the current and expected well head pressure, the estimated hydrogen sulfide concentration in the well gas, the estimated emission rates for hydrogen sulfide and sulfur dioxide, an air quality impact analysis for sulfur dioxide, the probable cause of excess gas buildup, and an assessment of any abatement alternatives.

If a request to flare excess gas is approved as necessary by the Department of Health, the approval may be subject to specified conditions. These conditions may include, but are not limited to, provisions requiring the permittee to install, operate, and maintain sulfur dioxide ambient monitors and to submit to the Department of Health after the flaring event a report on the times flaring actually occurred, the sulfur dioxide emissions determined through either direct or indirect measurements, and any problems encountered during the flaring process.

10. All access roads into the property shall be limited to authorized personnel only. Twenty-four hour staffing shall be in place during construction.
11. The permittee shall have proper safety devices on-site at least three days prior to commencement of drilling operations. A minimum of three breathing apparatus shall be available at the site and maintained by a qualified person/contractor. Wind socks shall be placed at two opposite edges of the drill site and on the drill floor. At least one person with certified hydrogen sulfide training to respond to hydrogen sulfide emergency episodes shall be on-site at all times.
12. Hydrogen sulfide abatement equipment with a minimum of 3,000 gallons of sodium hydroxide shall be on the property prior to the initiation of drilling, abated well cleanout and flow testing operations. Chemical storage tanks shall be maintained with sodium hydroxide at all times with no less than a three-day operating supply.
13. The permittee shall monitor the hydrogen sulfide concentration and emission rate during flow testing operations. The permittee shall utilize a cyclonic muffler or other equivalent device designed to minimize particulate and brine aerosol emissions, and direct venting into a vertical direction. During flow testing operations, if the abated hydrogen sulfide emission rate increases to five (5.0) pounds per hour or more, or if any steam is released through the power plant emergency steam release facility, the permittee shall cease operations and shut-in the well. The Department of Health shall be so notified and the problem corrected before testing operations can continue.

During periods of well equipment failure or malfunction which result in hydrogen sulfide emissions, the permittee shall apply best available control technology for the air emissions and take immediate steps to correct the condition. The Department of Health shall be immediately notified of the well equipment failure or malfunction. If the well equipment in question cannot be repaired within twenty-four (24) hours of the occurrence or the hydrogen sulfide ambient concentration exceeds the specified limits in Special Condition Nos. 23 and 27, the permittee shall cease operations and shut-in the well in accordance with Special Condition Nos. 23 and 27. Within five (5) days of the occurrence, a report shall be submitted to the Department of Health. The report shall include a description of the equipment failure or malfunction, the date of the initial failure, the estimated resultant emissions, time and duration of the event, and the repairs conducted to restore normal operations. Compliance with this notification provision shall not excuse or otherwise



constitute a defense for any violation(s) of this permit, law, rule, or order which results from the well equipment failure or malfunction.

14. Wet chemical tests for the determination of the hydrogen sulfide concentrations shall be conducted and recorded at least four times per 24-hour period during abated well cleanout, flow testing and periods of drilling operations where geothermal steam is released to the atmosphere. Additional wet chemical tests shall be required if previous results indicate a fluctuation in the hydrogen sulfide concentrations.
15. The following data shall be recorded during abated well cleanout, flow testing and periods of drilling operations where geothermal steam is released to the atmosphere:
  - a. At least four times per 24-hour period, hydrogen sulfide ppm upstream from the injection system.
  - b. At least four times per 24-hour period, injection rate of sodium hydroxide.
  - c. At least four times per 24-hour period, hydrogen sulfide concentration (ppm) downstream, after chemical injection, calculated hydrogen sulfide emission rate (lbs/hr) and calculated hydrogen sulfide abatement efficiency (percent).
  - d. Daily, the quantity of sodium hydroxide remaining in the abatement equipment storage tanks.

Additional entries will be made when significant changes in the resource occurs and when changes are made in injection rates of sodium hydroxide.

The aforementioned daily records a., b., and c. shall also be reported daily to the Department of Health by telephone no later than noon of the following work day. The Department of Health may at any time request additional data or revise the frequency of this daily telephone reporting requirement.

The records shall be kept at the well location at all times during the drilling, abated well cleanout and flow testing operations and shall be made available upon request by the Department of Health or its duly authorized representative. Copies or summaries of the records shall be provided within a reasonable time upon request by the Department of Health. The records shall be retained for at least three years following the data of such records.

16. The permittee shall maintain a 24-hour telephone service to accept calls concerning this Authority to Construct. This telephone number must be operational prior to commencement of construction.

17. No more than two (2) drilling rigs may be used simultaneously in the well drilling operations. During well drilling operations, the release of any geothermal steam shall be diverted to the hydrogen sulfide abatement equipment or action immediately taken to shut-in the well. The hydrogen sulfide abatement equipment shall consist of a cyclonic muffler or other equivalent device designed to minimize particulate and brine aerosol emissions, and direct venting into a vertical direction.

In no case shall the cumulative steam releases from all simultaneous well drilling operations result in total hydrogen sulfide emissions of five (5.0) pounds per hour or more. During any period when two drilling rigs are operating simultaneously, the operator of each rig shall immediately notify the other operator of any steam release and the resulting hydrogen sulfide emissions. If the cumulative steam releases from either or both well drilling operations result in total hydrogen sulfide emissions of five (5.0) pounds per hour or more, the permittee shall take immediate action to shut-in the wells, and shall so notify the Department of Health.

Records of each steam release shall be maintained and include as a minimum, date, time and duration of steam release, the resultant emissions, chemical injection rate, steam flow rate, and any corrective measures taken. The records shall be in a permanent form suitable for inspection, shall be made available upon request by the Department of Health, and shall be retained for at least three (3) years following the date of such records.

18. During drilling, abated well cleanout and flow testing operations, the permittee shall utilize a cyclonic muffler or other equivalent device designed to minimize particulate and brine aerosol emissions, and direct venting into a vertical direction. A minimum sodium hydroxide treatment mole ratio of 4 to 1 (NaOH/H<sub>2</sub>S) will be used initially and the abatement efficiency monitored. The optimum mole ratios will be determined during the hydrogen sulfide abatement operations. A specific chemical treatment plan shall be submitted to the Department of Health prior to the commencement of drilling, abated well cleanout and flow testing operations. A copy of the plan shall be maintained at the site at all time and supervisory personnel shall be aware of its provisions at all times.
19. Should any toxic emissions of public health concern be encountered which requires dispersion into the ambient air as a mitigative action, the permittee shall promptly notify the Department of Health. Attempts shall be made to fully abate the toxic and hydrogen sulfide emissions by utilizing a cyclonic muffler or other equivalent device designed to minimize particulate and brine aerosol emissions, and direct venting into a vertical direction.
20. The permittee shall perform testing and analyses for all of the following constituents of the steam condensate, steam, particulates and/or gases emanating from each well:

**STEAM CONDENSATE/TOTAL STEAM/TOTAL BRINE**

Benzene  
Ammonium (Total)  
Arsenic  
Lead  
Cadmium  
Bicarbonate and Carbonate  
Sulfates  
Chlorides  
Nitrates  
Boron (Total)  
Hydrogen Sulfide (Total)  
Fluorides (Total)  
Total Sulfur  
Mercury (Total)  
pH  
Total Dissolved Solids  
Total Suspended Solids  
Percent Noncondensibles  
Hydrogen Chloride  
NESHAPS Pollutants

**GAS PHASE**

Benzene  
Hydrogen Sulfide  
Ammonia  
Radon 222 and  
daughters  
Mercury Vapor  
Methane  
Non-Methane  
Hydrocarbons  
Carbon dioxide  
Sulfur dioxide  
Hydrogen Chloride  
NESHAPS

The sampling and testing of the resource shall be performed once upon experiencing the first steam release, and at least once during abated well cleanout and once during the testing operations. During normal operation of each well, sampling and testing shall be performed on an annual basis, provided that the hydrogen sulfide concentration does not deviate more than  $\pm 10$  percent of the previous measurement, or every six (6) months if the hydrogen sulfide concentration deviates more than  $\pm 10$  percent of the previous measurement. The sample of the resource shall be submitted to a qualified laboratory for analyses within five (5) days after obtaining the resource sample. The permittee shall submit a copy of the results of the analyses to the Department of Health within five (5) days after receiving the results from the qualified laboratory. The Department of Health may at any time require the permittee to analyze for additional constituents of the resource or perform more frequent testing.

21. The two (2) 860 HP diesel engine generators for rig no. 1 and the three (3) 877 HP diesel engines for rig no. 2 shall be fired only on fuel oil no. 2 with a maximum sulfur content not to exceed 0.5 percent by weight. For rig no. 2, only two (2) of the three (3) 877 HP diesel engines may be operated at any given time, and in no case shall all three (3) 877 HP diesel engines be operated simultaneously.

On a twelve (12) month rolling average, the total combined fuel usage of all five (5) diesel engines shall not exceed 275,124 gallons.

Prior to the startup of rig no. 2, the permittee shall install non-resetting fuel metering systems for the permanent recording of the total gallons of fuel consumed by each of the five (5) diesel engines associated with both rigs no. 1 and no. 2. The permittee shall maintain records on a monthly basis on the total amount of fuel oil consumed by each diesel engine. In addition, records shall be maintained on the total amount of fuel oil consumed by the associated diesel engines for the drilling of each well. Both records shall be submitted to the Department of Health at the completion of each well.

Prior to the startup of rig no. 2, the permittee shall retard the fuel injection timing of each of the three (3) diesel engines servicing rig no. 2 six (6) degrees from the manufacturer's recommended standard injection timing setting. The permittee shall maintain the level of injection timing retard at all times during operation of the engines through a regular program of inspection and maintenance. Upon completion of the setting of the fuel injection timing retard of six (6) degrees, the permittee shall submit to the Department of Health a copy of the work order and documentation certifying the fuel injection timing of each of the three (3) diesel engines.

22. The unabated venting of a geothermal well is prohibited. During well cleanout, the geothermal resource shall be directed through the hydrogen sulfide abatement equipment. The permittee shall utilize a cyclonic muffler or other equivalent device designed to minimize particulate and brine aerosol emissions, and direct venting into a vertical direction. Prior to any abated well cleanout, the Department must be informed in writing a minimum of two (2) days prior to commencement and so concur. The public shall be notified a minimum of 24-hours in advance by notices in the newspapers of general circulation in Hawaii County. In addition, the permittee shall make a reasonable effort to notify all residents living within 3,500 feet of the permittee's property boundary a minimum of 24-hours in advance of each abated well cleanout. In preparation for flow testing, each abated well cleanout shall be conducted only during the daytime and performed for no more than a total of four (4) hours.

In no case shall any abated well cleanout coincide with any pipeline cleanouts, well drilling which opens new hole, or well flow testing operations, or commence if the power plant emergency steam release facility is being utilized. If emergency steam releases from the power plant occur during any abated well cleanout, the well cleanout operations shall be terminated as quickly as practical.

23. The combined emissions of hydrogen sulfide from the 25 MW geothermal power plant (A-834) and associated wellfield (A-833), including periods of equipment failure or malfunctions shall not cause or contribute to an exceedance of the hydrogen sulfide ambient level of 10 ppb on a twenty-four-hour rolling average or 25 ppb on a one-hour average at or beyond the project boundary. Should any of the approved air quality monitoring stations indicate a hydrogen sulfide ambient concentration greater than 10 ppb on a twenty-four-hour rolling average or 25 ppb on a one-hour average, the permittee shall immediately notify the Department of Health and the Hilo District Health Office, ceasing all well drilling, flow testing, and abated well cleanout operations, and shutting in those wells experiencing equipment

failure or malfunction, which result in emissions of hydrogen sulfide. The affected wellfield construction activities shall be allowed to proceed only after the permittee has satisfactorily demonstrated to the Department of Health that the contributions from the well drilling, well flow testing, abated well cleanout operations or well equipment repair will not result in or contribute to the exceedance of the hydrogen sulfide ambient concentration of 10 ppb on a twenty-four-hour rolling average or 25 ppb on a one-hour average.

The permittee shall submit to the Department of Health a written follow-up report within five (5) days of the occurrence. The report shall include the date, time, and duration of the exceedance(s), the status of all project operations during the exceedance, the estimated project emissions and any other emission sources that may have contributed to the exceedance, and all corrective measures and actions to reduce project emissions to a minimum. Compliance with this notification provision shall not excuse or otherwise constitute a defense to any violation(s) of this permit or of any law or regulations.

24. (Previously Deleted)
25. The permittee may be required to install a control system acceptable to the Department of Health for the rapid throttling of steam flow and well shut-in on each developmental well prior to the well being connected to a resource distribution system. The requirement for a control system may be so specified in the subsequent Permit to Operate.
26. To prevent well blowouts, the permittee shall employ good drilling practices with proper blowout prevention equipment and experienced personnel in the drilling of the exploratory/developmental wells. Drilling supervisors shall be certified in blowout prevention at a minimum of once every two years by a recognized training center. In the unlikely event of a well blowout, the permittee shall immediately proceed with measures to kill or gain control of the well and notify the Department of Health.  
  
The permittee shall submit to the Department of Health a written report within five (5) days of the blowout. The report shall include, as a minimum, the probable cause of the blowout, the actions that have or will be taken, the estimated time before the well is controlled, an analysis of the air quality impact from the unabated emissions, and a monitoring plan to determine the actual air quality impact resulting from the blowout. A status report shall be submitted to the Department of Health on a weekly basis until such time the control of the well is established.
27. During those periods of normal power plant and normal wellfield operations, the combined emissions of hydrogen sulfide from the 25 MW geothermal power plant (A-834) and associated wellfield (A-833) shall not cause an increase in the hydrogen sulfide ambient concentration in excess of 5 ppb (above background) on a one-hour average at or beyond the project boundary as monitored at any of the approved air quality monitoring stations and so identified in the monthly monitoring report. As used in this context, a normal power plant operation is a power plant which is operating without any pipeline cleanouts, upsets,

**ATTACHMENT II  
ATC NO. A-833-795  
WELLFIELD  
JULY 17, 1992  
PAGE 9**

equipment failure, malfunction or which is otherwise operating normally. A normal wellfield operation is a wellfield in which no well drilling, flow testing, or abated well cleanout are occurring and where the completed wells are not experiencing any equipment failure or malfunction and are either shut-in, being used as an injection well, or connected to a sound geothermal resource distribution system.

28. (Previously Deleted)
29. Prior to the commencement of any geothermal well drilling, abated well cleanout, or flow testing operations which will result in the release of geothermal steam to the atmosphere, the permittee shall submit to, and receive the approval of, the Department of Health a sampling and testing protocol, identifying the analytical procedures and methodologies to be used and the constituents to be measured, which shall seek to physically and chemically characterize the particulate and aerosol emissions and corresponding ambient concentration from these operations. Each collected sample shall be submitted to a qualified laboratory for analyses within (5) days after the sample is collected. The permittee shall submit a copy of the results of the analyses within five (5) days after receiving the results from the qualified laboratory. The Department of Health may at any time require the permittee to analyze for additional constituents or perform more frequent testing.

RECEIVED  
92 JUL 22 A 6: 52  
DIV OF WATER &  
LAND DEVELOPMENT

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

July 17, 1992

92-A480

Mr. Steven E. Morris  
Vice President and General Manager  
Puna Geothermal Venture  
101 Aupuni Street, Suite 1014-B  
Hilo, Hawaii 96720

Dear Mr. Morris:

Subject: Authority to Construct (ATC) No. A-834-796  
Permit Modification and Compilation  
25 MW Geothermal Power Plant  
Located at TMK: 1-4-01:2 and 1-4-01:19, Kilauea Lower  
East Rift Zone, Puna, Hawaii


The Department of Health, in accordance with the requirements of Chapter 91, Hawaii Revised Statutes (HRS), amended and compiled Chapters 11-59 and 11-60, Hawaii Administrative Rules (HAR). These rules, among other things, amended the State's air quality rules, and became effective on June 29, 1992.

Special condition number 1 of Authority to Construct (ATC) No. A-834-796 specifically notes that the ATC may be revised to conform to the State's air quality rules. Pursuant to special condition number 1 (as well as Chapter 342B, HRS, and Chapters 11-59 and 11-60, HAR), the Department of Health has consolidated the prior permit changes and made additional minor revisions to ATC No. A-834-796 to conform to our most recent amendments to the State's air quality rules.

Enclosed with this letter are Attachments I and II. The conditions set forth in Attachments I and II supersede in their entirety the conditions issued with ATC No. A-834-796 dated February 6, 1990, and as modified on March 16, 1990 and January 13, 1992.

These modifications shall become final twenty (20) days after receipt, unless before the twenty (20) days expire, Puna Geothermal Venture submits a written statement to the Director of Health either waiving its right to a hearing or requesting a hearing pursuant to Chapter 91 and Chapter 342B, HRS. If a hearing is requested, it will be held at a date, time, and place to be specified later and conducted in accordance with Chapter 91, HRS, and the Rules of Practice and Procedure of the Department of Health.

Very truly yours,

  
JOHN C. LEWIN, M.D.  
Director of Health

Enclosures  
c: DHS, Hawaii

**ATTACHMENT I. STANDARD CONDITIONS OF AUTHORITY TO CONSTRUCT, NO. A-834-796  
APPLICATION NO. A-834  
POWER PLANT**

**Modified and Compiled: July 17, 1992**

This permit is granted in accordance with the State of Hawaii Administrative Rules, Title 11, Chapter 60, Air Pollution Control, and is subject to the following standard conditions:

1. This permit is non-transferable from person to person, from place to place, or from one piece of equipment to another.
2. This permit is automatically void if construction has not begun within one year of the date of issuance or if the work involved is suspended for one year or more.
3. This permit is automatically void when a Permit to Operate is issued or denied.
4. The facility covered by this permit shall be constructed as specified in the application for Authority to Construct. There shall be no deviation unless additional or revised plans are submitted to and approved by the Department.
5. This permit is not a guarantee that the facility will receive a Permit to Operate at the end of the construction period, nor does it absolve the holder from the responsibility for the consequences of non-compliance with all Rules, Regulations, and Orders of the Department.
6. This authority, (a) shall not in any manner affect the title of the premises upon which the equipment is to be located, (b) does not release the permittee from any liability for any loss due to personal injury or property damage caused by, resulting from or arising out of the design, installation, maintenance, or operation of the proposed equipment, (c) does not release the permittee from compliance with other applicable statutes of the State of Hawaii, or with applicable local laws, regulations, or ordinances, and (d) in no manner implies or suggests that the Department, or its officers, agents, or employees, assumes any liability, directly or indirectly, for any loss due to personal injury or property damage caused by, resulting from or arising out of the design, installation, maintenance, or operation of the proposed equipment.
7. The Department is to be notified promptly in writing upon completion of the construction or installation of any equipment for which an Authority to Construct has been issued.
8. The operation of this equipment is sanctioned by this Authority to Construct provided that the permittee has completed the following:
  - (a) Submittal of written notification of completion of construction or installation to the Department;
  - (b) Submittal of Permit to Operate Application, Form AS-P-3, to the Department; and
  - (c) Adherence to all applicable "special conditions" as included in the Authority to Construct.



**ATTACHMENT II. SPECIAL CONDITIONS OF AUTHORITY TO CONSTRUCT, NO. A-834-796  
APPLICATION NO. A-834  
POWER PLANT**

**Modified and Compiled: July 17, 1992**

In addition to the standard conditions of the Authority to Construct, this permit is subject to the following special conditions:

1. The permit conditions prescribed herein may at any time be revised by the Department of Health to conform to any Federal or State promulgated air quality rules on geothermal facilities.
2. The total fugitive isopentane emissions from all ten (10) Ormat Energy Converter (OEC) modules shall not exceed 0.4 lbs/hr or exceed 1000 ppm from any seal, flange, valve or any other fugitive emission point when measured from a distance of two (2) inches from the point. The permittee shall perform measurements on all fugitive isopentane emission points, as a minimum, on a weekly basis. The permittee shall take immediate corrective actions upon identifying any isopentane emissions in excess of 1000 ppm when measured from a distance of two (2) inches.
3. Records shall be maintained on all isopentane emission measurements, the amount of gallons of isopentane purchased, the amount of isopentane transferred to and from the OEC modules, and the amount of isopentane released to the atmosphere. The records shall be in a permanent form suitable for inspection, shall be made available upon request by the Department of Health, and shall be retained for at least three (3) years following the date of such records. A report on the amount of isopentane released to the atmosphere shall be submitted to the Department of Health on an annual basis.
4. The geothermal fluids injection system shall include at least two (2) geothermal injection wells, a spare fluid pump, and a spare noncondensable gas compressor. The backup injection system equipment shall be maintained in good operating condition at all times and shall be utilized immediately upon identification of any malfunctioning equipment.

In the event of an equipment malfunction or upset condition which results in a situation where the two geothermal injection wells are not capable of handling the total geothermal resource being utilized by the power plant, the power plant production and the associated geothermal resource being used shall be immediately reduced accordingly to the handling capacity of the two injection wells.

5. The diesel engine generator and the diesel firewater pump shall be fired only on diesel fuel oil no. 2 with a maximum sulfur content not to exceed 0.5% by weight.
6. The unabated cleanout of a pipeline utilizing the geothermal steam is prohibited. If the geothermal steam is used in the pipeline cleanout, the geothermal steam shall be directed through the hydrogen sulfide abatement equipment. The permittee shall utilize a cyclonic muffler or other equivalent device designed to minimize particulate and brine aerosol emissions, and direct venting into the vertical direction. In no case shall any abated pipeline cleanout coincide with any abated well cleanout, well drilling which opens new hole, or well flow testing operations, or commence if the emergency steam release facility is being utilized by the power plant. If emergency steam releases from the power plant occur during any

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pipeline cleanout, the pipeline cleanout operations shall be terminated as quickly as practical. Prior to any pipeline cleanout, the Department of Health must be informed in writing, a minimum of two (2) days prior to commencement and so concur. The public shall be notified a minimum of 24-hours in advance by notices in the newspapers of general circulation in Hawaii County. In addition, the permittee shall make a reasonable effort to notify all residents living within 3,500 feet of the permittee's property boundary a minimum of 24-hours in advance of any pipeline cleanout. Each pipeline cleanout shall not exceed 20 minutes in duration and shall occur only in the daytime.

7. The permittee shall install, operate, and maintain a minimum of three (3) meteorological monitoring stations, three (3) air quality monitoring stations for hydrogen sulfide and one (1) PM<sub>10</sub> monitor. The monitoring stations required in any permit for the wellfield may be used towards fulfilling this requirement.

Prior to the commencement of plant operations, the permittee shall submit the siting of the air quality and meteorological monitoring stations for the Department of Health's approval. The permittee shall include with the siting locations a list of the monitoring equipment installed at each station and any anticipated modifications. As a minimum, two ambient air quality monitoring stations for hydrogen sulfide and one meteorological monitoring station shall be fully operational prior to commencement of plant operations. All three meteorological monitoring stations, three ambient air quality monitoring stations for hydrogen sulfide and the one PM<sub>10</sub> monitor shall be installed and fully operational on or before August 15, 1992. The permittee shall maintain a file of all measurements, including the monitoring system performance evaluations; calibration checks; and adjustments and maintenance performed on the system or devices. The measured data shall meet U.S. EPA capture requirements and quality assurance guidelines. As a minimum, a quality assurance check shall be conducted on each monitoring station every-other-day.

The air quality monitors shall be equipped with an alarm or acceptable equivalent system that is designed to page and notify the permittee or a governmental agency on a twenty-four hour basis of ambient hydrogen sulfide concentrations in excess of 10 ppb on a twenty-four hour average and 25 ppb on a one-hour average. The permittee shall immediately notify the Department of Health and the Hilo District Health Office of any exceedance above 10 ppb on a twenty-four hour rolling average and 25 ppb on a one-hour average.

Two (2) copies of the data file in a format acceptable to the Department of Health shall be submitted on an annual basis. The data file shall be in a format that can be utilized by a personal computer for ready extraction of data. The air quality and meteorological data shall be summarized and submitted monthly in writing to the Department of Health. Additional information on the monitoring stations and on the data collected shall be submitted upon request by the Department of Health.

8. At the discretion of the Director of Health the permittee may at any time be required to install, operate, and maintain additional air quality and meteorological monitoring stations, but only

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after due notice to the permittee on the reasons for the proposed change and providing the permittee an opportunity to respond within seven (7) days.

9. All access roads into the permittee's property shall be limited to authorized personnel only. Twenty-four hour staffing shall be in place during plant operations.
10. The emergency steam release facility, consisting of two (2) rock mufflers, chemical storage tank(s) and associated equipment, shall be installed, maintained, and be fully operational prior to commencement of plant operations. Each rock muffler shall be capable of handling a steam flow rate of 570,000 lbs/hr or 100 percent of the total power plant steam flow, whichever is greater.
11. The emergency steam release facility shall only be utilized under one or more of the following conditions:
  - a) Failure of the electrical transmission lines out of the power plant or some incident that tripped all the steam turbines and OEC units;
  - b) Complete upset of the geothermal fluid injection system;
  - c) Pressure in the steam lines exceeds safety design set points; or
  - d) Any upset situation which would otherwise result in a release of unabated steam to the atmosphere.
12. The emergency steam release facility shall be equipped and maintained at all times with a minimum three-day operating storage capacity of sodium hydroxide. The chemical abatement system shall operate automatically when steam is released through the rock muffler(s). The hydrogen sulfide concentrations shall be continuously monitored both downstream and upstream of the chemical injection point. A sodium hydroxide treatment mole ratio of 4 to 1 (NaOH/H<sub>2</sub>S) will be used initially and the abatement efficiency monitored. The optimum mole ratios will be determined during the hydrogen sulfide abatement operations.

Upon utilizing the emergency steam release facility, the permittee shall take immediate action to the extent practical to reduce the steam flow and perform the necessary corrective actions. The steam flow rate shall be reduced, as a minimum, to 50 percent of full flow within four (4) hours after initiating the use of the emergency steam release facility.

13. The permittee shall immediately notify the Department of Health of any operational upsets, equipment failure or malfunction which would allow an increase in the emissions of hydrogen sulfide, particulate matter or isopentane. The permittee shall apply best available control technology for the air emissions and take immediate steps to correct the condition. The permittee shall take appropriate action in accordance with Special Condition Nos. 15 and 17 if the hydrogen sulfide ambient concentration exceeds the specified limits in Special

Condition Nos. 15 and 17. In addition, a written report shall be submitted to the Department of Health within five (5) days of the occurrence. The report shall include a description of the malfunctioning equipment or abnormal operation, the date of the initial failure, the estimated resultant emissions, time and duration of the event, and the methods utilized to restore normal operations. Compliance with this notification provision shall not excuse or otherwise constitute a defense for any violation(s) of this permit, law, rule or order which results from the operational upset, equipment failure or malfunction.

14. The permittee shall maintain a 24-hour telephone service to accept calls concerning this Authority to Construct. This telephone number must be fully operational prior to commencement of construction.
15. The operation of the 25 MW geothermal power plant during periods of operational upsets, equipment failure or malfunctions shall not cause or contribute to an exceedance of the hydrogen sulfide ambient level of 10 ppb on a twenty-four-hour rolling average or 25 ppb on a one-hour average at or beyond the project boundary. Should any of the approved air quality monitoring stations indicate a hydrogen sulfide ambient concentration greater than 10 ppb on a twenty-four-hour rolling average or 25 ppb on a one-hour average, the permittee shall take immediate action terminating, within two (2) hours of the exceedance, all power plant activities not associated with normal power plant operations and contributing to hydrogen sulfide emissions. Following the reduction in project emissions, if the monitoring stations still indicate hydrogen sulfide ambient concentrations in excess of 10 ppb on a twenty-four-hour rolling average or 25 ppb on a one-hour average, the permittee shall curtail the power plant operations, unless the permittee can conclusively show to the Department of Health that the project operations and emissions are not contributing any impact to the monitoring site. If the hydrogen sulfide ambient concentration is below 10 ppb on a twenty-four-hour rolling average and 25 ppb on a one-hour average after the project emissions have been reduced, the permittee shall maintain the emissions at this reduced level until such time the Department of Health is assured that the resumption of full activity shall not result in another exceedance of the hydrogen sulfide ambient level of 10 ppb on a twenty-four-hour rolling average or 25 ppb on a one-hour average.

The permittee shall submit a written report to the Department of Health within five (5) days of the occurrence. The report shall include the date, time and duration of the exceedance, the estimated project emissions and any other emission sources that may have contributed to the exceedance, and all corrective measures and actions taken to reduce project emissions to a minimum. Compliance with this notification provision shall not excuse or otherwise constitute a defense for any violation(s) of this permit, law, rule or order.

16. (Previously Deleted)
17. During those periods of normal power plant and normal wellfield operations, the combined emissions of hydrogen sulfide from the 25 MW geothermal power plant (A-834) and associated wellfield (A-833) shall not cause an increase in the hydrogen sulfide ambient

concentration in excess of 5 ppb (above background) on a one-hour average at or beyond the project boundary as monitored at any of the approved air quality monitoring stations and so identified in the monthly monitoring report. As used in this context, a normal power plant operation is a power plant which is operating without any pipeline cleanouts, upsets, equipment failure, malfunction or which is otherwise operating normally. A normal wellfield operation is a wellfield in which no well drilling, flow testing, or abated well cleanouts are occurring and where the completed wells are not experiencing any equipment failure or malfunction and are either shut-in, being used as an injection well, or connected to a sound geothermal resource distribution system.

18. (Previously Deleted)
19. During normal power plant operations, the hydrogen sulfide emissions from the 25 MW geothermal power plant shall not exceed one pound per hour (one-hour average). During periods of malfunction or regularly scheduled maintenance, best available control technology shall be applied for the hydrogen sulfide emissions.
20. The Department of Health may at any time with reasonable cause, request the permittee to install, operate, and maintain emission monitors to continuously measure and record the hydrogen sulfide and isopentane emissions at any specified location in the power plant.
21. Prior to the commencement of any abated pipeline cleanout utilizing the geothermal steam, the permittee shall submit to, and receive the approval of, the Department of Health a sampling and testing protocol, identifying the analytical procedures and methodologies to be used and the constituents to be measured, which shall seek to physically and chemically characterize the particulate and aerosol emissions and corresponding ambient concentration from these operations. Each collected sample shall be submitted to a qualified laboratory for analyses within five (5) days after the sample is collected. The permittee shall submit a copy of the results of the analyses to the Department of Health within five (5) days after receiving the results from the qualified laboratory. The Department of Health may at any time require the permittee to analyze for additional constituents or perform more frequent testing.