

GEOTHERMAL ACTIVITY IN HAWAII

Speech by Bill Paty

American Public Works Association

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Introduction

Hawaii has the distinction of being the most oil-dependent state in the nation. Based on 1990 figures from DBED, 92% of Hawaii's energy was derived from oil. Approximately 6% is generated from biomass (sugar cane), 1% from solid waste, and only 1.4% from solar, coal, hydro, and wind combined.

So far, geothermal energy's contribution to our State's energy consumption is zero. We hope this will change, because we have a critical energy problem. Already on the Island of Hawaii, "rolling brownouts" are a frequent occurrence because of the electric utility's inability to meet the island's growing demand for electric power.

The State Energy Functional Plan calls for alternate energy resource development and the transition to an indigenous, renewable energy economy. Towards this end, geothermal energy has been regarded as the most viable solution to Hawaii's energy problem.

Our State's goal is to maintain a balance between geothermal development and the preservation of the environment. An important issue for our Department is the proper management of Hawaii's limited land area, including the need to preserve its unique and

pristine environment.

Our experience so far with geothermal development shows that we have under our land a powerful potential energy resource that can be properly regulated and developed. However, the course of geothermal development has not been easy or simple. We've had some setbacks, to put it mildly, which I will review with you later.

In spite of the setbacks and obstacles, we are convinced that this is a valuable resource that deserves further exploration and development. We cannot afford to ignore an energy source when our State's energy needs continue to grow. On Oahu, for example, peak demand for electricity has increased 20 percent since 1985. At that rate, it is expected to grow more than 40 percent in the next 10 years.

Background

The State's exploration efforts began with the successful drilling of the 3-megawatt HGP-A well in 1976 near Pohoiki, on the Island of Hawaii. The well was drilled to 6,455 feet with a bottomhole temperature of 676 degrees Fahrenheit.

The HGP-A well produced about 100,000 pounds per hour of steam and water, and produced about 2.8 megawatts or 2,800 kilowatts of electricity. This was enough energy to supply approximately 2,100 homes on the Island of Hawaii. The HGP-A power plant facility operated from 1981 to December 1989 when it was permanently closed down.

As a pioneer facility, it worked. But with its brine lake

with faulty emissions, it was a poor example of how a geothermal unit should function, and we had to live down that image.

The geothermal resource is not uniform everywhere. The characteristics of the geothermal fluid may vary from site to site. The resource may be vapor-dominated or, as in the case of the HGP-A well, liquid-dominated. The HGP-A resource is a water-dominated system, constituting 43% steam and 57% water.

A vapor-dominated resource like that found in the Puna Geothermal Venture wells provides more steam for power generation per hole while reducing the amount of brine which must be reinjected into the ground.

Here's how geothermal works: The geothermal fluid enters a separator unit which separates the steam phase from the brine or liquid phase. The steam phase exiting the separator consists primarily of water vapor and non-condensable gases which enter the turbine unit, turns the rotors, and exhausts into the condenser. The condensate from the condenser is combined with the separated brine and non-condensable gases and reinjected back into the reservoir. (2 ladies, Scotsman. All parts in good working order.)

Prospects for large-scale geothermal development led the 1983 Legislature to enact the Geothermal Resource Subzone Assessment and Designation Act.

The Act called for the Board of Land and Natural Resources to designate Geothermal Resource Subzone areas within which geothermal development could take place, regardless of existing land use classifications. Towards this end, DLNR initiated a statewide

assessment of geothermal resource potential for each county which was conducted by a committee of scientists and technical experts.

After several public hearings and contested case hearings, 4 areas (3 on Hawaii and 1 on Maui) were designated as Geothermal Resource Subzones (GRS). Total land area within these subzones is 26,000 acres.

In addition to the administration of subzone areas, DLNR has other regulatory responsibilities, including these:

1. The permitted use of lands within the Conservation Districts;
2. Administration of 6 Geothermal Resource Mining Leases encompassing approximately 14,000 acres;
3. Review and permitting of all proposed geothermal exploration and development activities;
4. Monitoring of geothermal field operations and inspection of geothermal well drilling activity;
5. Administration of the State's Historic Preservation Program, which requires review of all applicable projects to evaluate the effect of any proposed construction, alteration, or improvement of any nature on historic properties; and
6. Providing assistance and information through the Department's Geothermal/Cable Permit Center and coordinating the permit application and review process for the proposed geothermal/cable project.

Geothermal Activity

Since 1980, 3 geothermal developers have conducted commercial exploration and development operations in Hawaii. Currently, 2 remain actively involved -- Puna Geothermal Venture and True/Mid-Pacific.

To date, 12 geothermal production/injection wells and 3 Scientific Observation Holes have been drilled on the island of Hawaii. The maximum depths of these wells range from 5,000' to 8,300' in depth. The maximum temperatures recorded for these wells are between 400 to over 650 degrees Fahrenheit. The total steam and water flow rates for those wells capable of producing geothermal resources range from 33,000 to 100,000 pounds per hour.

Three geothermal projects have been permitted and monitored by the Department:

The University of Hawaii recently completed 3 Scientific Observation Holes along the Kilauea East Rift Zone. All of these "slim" holes revealed high temperatures. Additional testing may demonstrate that some have good permeability indicative of a potential geothermal resource area.

True/Mid-Pacific Geothermal Venture, headquartered in Wyoming, began exploratory drilling in late 1989. They had an 8-year permitting effort that included a land exchange between the State of Hawaii and Campbell Estate. True/Mid-Pacific has drilled a total of 4 holes (one vertical, 3 directional) from the same well bore and has flow-tested one of the directional holes.

Recently, they have received approval to mobilize to a **second well site** within the Kilauea Middle East Rift Zone.

The Blowout Incident

On June 12 and 13, Puna Geothermal Venture (PGV) incurred a blowout at one of their injection wells, well KS-8. Due to this incident, the County of Hawaii temporarily suspended all activity at the PGV project. Although construction of the power plant has been allowed to continue, drilling operations have yet to receive the necessary approvals to proceed.

The June 12 blowout incident lasted for 31 hours after drilling hit a relatively shallow resource at a depth of 3,400 feet. The blowout required the evacuation of some nearby residents and led to a declaration of a state of emergency by the Hawaii County Mayor Lorraine Inouye.

Subsequent to the blowout, the State and County initiated independent investigations of the incident. The investigations included a review of drilling equipment and procedures, noise and emission abatement, and monitoring procedures. In addition, the Department of Health and Hawaii County Civil Defense conducted a review and evaluation of PGV's emergency response plan.

As the investigations were being completed and the reports being distributed to the public, work was undertaken to quench and control well KS-8. Quenching operations included pumping a high volume of water on the order of 1,300 gpm for approximately 26 hours. It took about 2,100,000 gallons to lower the temperatures and pressures in the well!

The injection of water was followed by pumping large

quantities of heavy-weight drilling mud. Following the weighted mud, cement was pumped into the well through a 7" diameter casing in order to set a cement plug at depth, approximately 3,376 feet.

On October 1, well KS-8 was officially declared secured and under control.

In retrospect, the blowout could not have come at a worse time. We were on the verge of providing power to the grid. We had touted the systems as environmentally safe. The blowout reenergized the anti-geothermal community and brought us to the recognition that our approved procedures, with respect to both drilling and monitor controls, were less than adequate.

New Safety Measures

The blowout incident caused State and county officials and the developer to make almost complete overhaul of safety and monitoring activities for geothermal activities. A joint State and County Geothermal Task Force has met regularly since August to develop a Geothermal Management Plan. The Plan identifies specific actions for the developer and government agencies to prevent future blowouts. The concern is to ensure the health and safety of PGV personnel and the nearby residents.

At one time serious consideration was being given to a master plan for the large-scale geothermal interisland undersea cable project that looked to expect some 500 megawatts from the Big Island to Oahu. Given the fact that there have been serious delays in assessing the total resource and the recent ruling by a federal

judge that an Environmental Impact Statement would be required before designated federal funding could be utilized, this project has been put on the back burner. The Administration is concentrating on developing some 50 megs to meet just the Big Island's power requirements.

World-wide experience in producing electricity from geothermal energy has shown that the process is one of the most environmentally acceptable methods of generating power on a large-scale basis. Both the U.S. Department of Energy and the California Energy Commission consider the production of electricity from geothermal energy to be environmentally cleaner than production from oil or other fossil fuel sources, especially regarding air quality.

The designation of geothermal resource subzones, along with other established statutes and regulations, are intended to facilitate the orderly development of geothermal energy in Hawaii. It is the goal of our Administration to ensure that exploration, development, and production of electricity from geothermal resources take place in consonance with our State's energy goals and our responsibility to preserve Hawaii's unique social and natural environment.

Public "Participation"

All this technical information seems so dry when compared to the other half of the story, that of the opposition to geothermal development. Opposition was vociferous from the start and has

"gathered steam" (forgive the pun) as geothermal development progressed.

The geothermal permitting process is an illustration of democracy in action. For the True-Mid Pacific project involving a land exchange between Campbell Estate and the State, there were many public hearings and 4 contested case hearings. During the contested case process, the Board of Land and Natural Resources held more than 35 days and nights of hearings. Various community groups were allowed to present live witnesses and testimony at each stage of the permitting process.

There have been demonstrations and arrests and lots of media attention on this colorful aspect of the story.

Several environmental studies have been commissioned by State and federal agencies, Hawaii Electric Company and the geothermal developers. So far there have been 6 Environmental Impact Statements and 6 Environmental Assessments completed on various aspects of geothermal development on the Big Island.

The number of environmental studies completed since 1978 is topped only by the number of lawsuits filed to stop geothermal development. There have been at least 6 independent lawsuits filed against 3 projects--plus numerous appeals of agency decisions. I lost count at 10 court actions. . . All except one of the lawsuits against the State have been dismissed or upheld State decision-making process. Litigation is still pending against the State for yet another EIS.

A capsule history of community opposition to geothermal

development reads like a "Who's Who" of environmental activism. Topping the list of protagonists is the Pele Defense Fund, which has filed at least 6 lawsuits to stop geothermal development on religious, socio-economic, technical, health and safety grounds. The Rainforest Action Network sued to halt \$15 million in federal funding.

Other groups over the years have included the Blue Ocean Preservation Society, Greenpeace Hawaii, Greenpeach USA, Sierra Club, Sierra Club Legal Defense Fund, Friends of the Earth, Environmental Action, Rainforest Action Network, National Parks and Conservation Association, a group called "Citizens for Responsible Energy Development with Aloha Aina," Big Island Residents Against Geothermal, Puna Community Council, and Kapoho Community Association. The one group that has steadfastly supported geothermal development is the Big Island Geothermal Alliance, comprised of members of the business community. (SHOW POSTER)

A non-profit, San Francisco-based public relations company, the Public Media Center, joined the action in 1987 with an ad campaign in Hawaii and major Mainland newspapers. The Mainland group, Rainforest Action Network, came on board in 1989.

In July of this year a group of Puna residents sued PGV for damages, claiming that the June blowout caused them harm and a decrease in property values. In August another lawsuit was filed, based on claims of nuisance, trespassing and personal injury.

Mediation as Dispute Resolution

In an effort to resolve the disputes between the pro-and anti-geothermal interests, the Hawaii County Planning Commission in 1989 established Rule 12, which replaces the contested case process with mandated mediation for geothermal permits. So far this new rule has resulted in two formal mediation efforts. The sessions, mediated by the State Judiciary's Center for Alternative Dispute Resolution, were seen as a more informal alternative to the expensive and time-consuming contested case process.

(17 MULES)

In the first case, the University of Hawaii and the State applied for a permit to drill several Scientific Observation Holes. There were community objections. Mediation did not work in this case. The parties did not reach agreement, due to the community's perception that the SOH project was the beginning of the State's development of 500 megawatts of geothermal energy for shipment to Oahu.

Community members filed a lawsuit claiming that Rule 12 requiring mediation deprived them of their due process of a contested case hearing. The applicants received a permit and has proceeded with drilling the Scientific Observation Holes.

In the second series of sessions, the parties involved--Puna Geothermal Venture and members of the Puna community and Hawaii County officials--successfully reached agreements. The mediator prepared a report listing recommendations to which PGV agreed. The recommendations, covering the community's concerns about

procedures, geology, hydrology, air quality, noise, health and safety, subsequently were included in PVG's geothermal permit conditions.

You haven't really been to a community meeting until you have attended a geothermal meeting in Pahoa in the heart of our geothermal resource subzone. After the blowout of the PGV well in June, we brought a special team of thermal drilling experts and health monitoring specialists to do a complete review of the blowout and the resulting health and monitoring problems.

When the experts had completed their report, we had a press conference at the Mayor's office. The lead investigator held forth in somewhat pontifical terms that in spite of the blowout, there were no problems that could not be handled if proper procedures were followed, and that geothermal drilling could proceed, etc. And he looked good on camera.

Well, that evening beginning at 6:00 we were to review the findings of the special committee with the residents of the Pahoa community. We were all in this little gym seated at a large table. The place was packed, and when we walked in I could feel it was going to be a night to remember. After introductory remarks, the mike is passed to this "lead guy" again and he gives a big smile and starts in on his report. He was looking to do a "Big Brother Knows Best" number at the crowd.

He gets to about one-half minute into his pitch and says something to the effect that the geothermal drilling can be done in a safe and environmentally acceptable way. A guy in the

bleachers yells out, "BULLSHIT," and a lady down in front is giving him the active "bird". The boos resound. It is downhill from there. He passes the mike over to the next guy so fast you couldn't believe it and skips over the rest of his summation.

It was quite an evening. The only reason we got out at 11:00 p.m. was that the lights in the gym went off. Nothing had prepared this team for what they got by way of community response in Pahoehoe, believe me.

However, with respect to mediation, I have concluded that mediation and facilitated public dialogs hold great promise for the State and the community in forming public policy. The State is refining these tools and has used them in resolving several important land use and human services issues. However, key to their success are the manner in which the process is designed and conducted, and the degree of commitment of the parties involved to resolution of conflict.

I am concerned that making mediation mandatory may not be the best way to resolve conflict. People need to feel that they have full access to the legal system, a right guaranteed in the U.S. Constitution. One of the basic assumptions of mediation is that it is a **voluntary** process. That means the parties have agreed that **they want to be at the negotiating table** and that they want to find solutions. It removes the adversarial atmosphere.

To conclude, the Administration remains firmly in support of geothermal development to help meet Hawaii's power requirements.

With new procedures in place, we will continue to develop this resource. We probably won't be able to have 25 megs on line by the end of this year, but things look promising for that amount of power to be on line by early 1992.

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SPEECH OUTLINE

I. Introduction

- A. In 1990, Hawaii derived over 90% of its total energy needs from oil and has the distinction of being the most oil dependent State in the nation. Based on 1990 figures compiled by the DBED, 92% of Hawaii's energy was derived from oil, with approximately 6% generated from biomass (i.e. sugar cane), 1% from solid waste, 1.4% from solar, coal, hydro, and wind combined. However, geothermal energy's contribution to our State's total energy consumption is currently zero.

(Optional: Of the total amount of oil consumed by the State (50,485,000 barrels or 2,120,370,000 gallons - 1989 figures), 41% is for aviation fuel, 27% for electricity generation, 20% for automotive gasoline and diesel, and 12% for other uses such as propane and synthetic natural gas.)

Our State's Energy Functional Plan calls for alternate energy resource development and the transition to an indigenous renewable energy economy. Towards this end, geothermal energy has been regarded as the most viable solution to Hawaii's critical energy problem.

- B. Our State's goal has been to maintain a balance between geothermal development and the preservation of the environment. As such, the proper management of Hawaii's limited land area, including the need to preserve its unique and pristine environment, has for many years been an important issue for our Department.

II. Background

- A. The State's initial exploration efforts began with the successful drilling of the 3 megawatt HGP-A well in 1976 near Pohoiki, on the island of Hawaii. The well was drilled to 6,455 feet with a bottomhole temperature of 676 degrees Fahrenheit. The HGP-A well produced about 100,000 lbs/hr of steam and water and produced about 2.8 megawatts or 2,800 kilowatts of electricity, enough energy to supply approximately 2,100 homes on the Island of Hawaii. The HGP-A power plant facility was operated from 1981 to December 1989 when it was permanently closed down.
- B. The characteristics of the geothermal fluid may vary from site to site. The resource may be vapor dominated or as in the case of the HGP-A well, liquid dominated. The HGP-A resource is a water dominated system constituting 43% steam and 57% water. A vapor dominated resource like

that found in the Puna Geothermal Venture wells provides more steam for power generation per hole while reducing the amount of brine which must be reinjected into the ground.

Basically, the geothermal fluid enters a separator unit which separates the steam phase from the brine or liquid phase. The steam phase exiting the separator consists primarily of water vapor and non-condensable gases which enters the turbine unit, turns the rotors, and exhausts into the condenser. The condensate from the condenser is combined with the separated brine and non-condensable gases and reinjected back into the reservoir.

- C. Prospects for large-scale geothermal development led the 1983 Legislature to enact the Geothermal Resource Subzone Assessment and Designation Act.
 - 1. The Act called for the Board of Land and Natural Resources to designate Geothermal Resource Subzone areas within which geothermal development could take place, regardless of existing land use classification. Towards this end, DLNR initiated a statewide assessment of geothermal resource potential for each county which was conducted by a Geothermal Resource Technical Committee comprised of scientists and technical experts.
 - 2. After several public hearings and contested case hearings (4) areas (3 on Hawaii and 1 on Maui) were designated as Geothermal Resource Subzones (GRS) totaling approximately 26,000 acres.

- D. In addition to the administration of subzone areas, DLNR's regulatory responsibilities include, but is not limited to:
 - 1. The permitted use of lands within the Conservation Districts established by the State Land Use Commission;
 - 2. Administration of (6) Geothermal Resource Mining Leases encompassing approximately 14,000 acres;
 - 3. Review and permitting of all proposed geothermal exploration and development activities;
 - 4. Monitoring of geothermal field operations and inspection of geothermal well drilling activity;

5. Administration of the State's Historic Preservation Program requiring Historic Site review of all applicable projects to evaluate the effect of any proposed construction, alteration, or improvement of any nature on historic properties; and
6. Providing assistance and information through the Department's Geothermal/Cable Permit Center and coordinating the consolidated interagency permit application and review process for the proposed geothermal/cable project.

III. Geothermal Activity

- A. Since 1980, (3) geothermal developers (Barnwell Geothermal Corporation, Puna Geothermal Venture, and True/Mid-Pacific Geothermal Venture) have conducted commercial exploration and development operations in Hawaii. Currently, (2) remain actively involved - Puna Geothermal Venture and True/Mid-Pacific.
- B. To date (12) geothermal (production/injection) wells and (3) Scientific Observation Holes have been drilled on the island of Hawaii. The maximum depths of these wells range from 5,000' to 8,300' in depth. The maximum temperatures recorded for these wells are between 400 to over 650 degrees Fahrenheit. The total flow rates (steam and water) for those wells capable of producing geothermal resources range from 33,000 to 100,000 lbs/hr.
- C. Presently, three geothermal projects have been permitted and monitored by the Department:
 1. The University of Hawaii recently completed (3) Scientific Observation Holes (SOH) along the Kilauea East Rift Zone. All of the "slim" holes revealed high temperatures and additional testing may demonstrate that some have good permeability indicative of a potential geothermal resource area.
 2. True/Mid-Pacific Geothermal Venture, headquartered in Wyoming, commenced exploratory drilling in late 1989 after an eight year permitting effort that included a land exchange between the State of Hawaii and Campbell Estate. To date, True/Mid-Pacific has drilled a total of (4) holes (1 vertical, 3 directional) from the same well bore and has flow tested one of the directional holes. Most recently, they have received approval to mobilize to a second well site within the Kilauea Middle East Rift Zone.
 3. Since the June 12-13 blowout of geothermal injection well Kapoho State No. 8 (KS-8), activity at the Puna Geothermal Venture (PGV) project has been

temporarily suspended. Although construction of the power plant has been allowed to continue, drilling operations have yet to receive the necessary approvals to proceed.

The June 12 blowout incident lasted for 31 hours after drilling encountered a relatively shallow resource at a depth of approximately 3,400 feet. The blowout required the evacuation of some nearby residents and led to a Declaration of a State of Emergency by the Hawaii County Mayor.

Subsequent to the blowout, the State and County jointly initiated independent investigations of the incident, which included a review of drilling equipment and procedures, noise and emission abatement, and monitoring procedures. In addition, a review and evaluation of PGV's emergency response plan was conducted by the Department of Health and the Hawaii County Civil Defense.

Concurrent with the completion of the investigations and the public distribution of the reports, work was undertaken to quench and control well KS-8. Quenching operations included pumping a high volume of water on the order of 1,300 gpm for approximately 26 hours (totaling approximately 2,100,000 gallons). The injection of water was followed by pumping large quantities of heavy weight drilling mud. Following the weighted mud, cement was pumped into the well through a 7" diameter casing in order to set a cement plug at depth (approximately 3,376'). On October 1, 1991, well KS-8 was officially declared secured and under control.

IV. Current Status

- A. A joint State and County Geothermal Task Force has met regularly since August to develop a Geothermal Management Plan which identifies specific developer and government agency actions necessary to minimize the potential for future adverse impacts to the health and safety of PGV personnel and the residents of nearby communities.
- B. The State has also initiated the preparation of a Master Development Plan for the large scale geothermal/inter-island cable project, overland transmission corridor analyses, an Environmental Impact Statement, and a public information and participation program.
- C. Negotiations are also underway between Hawaiian Electric Company and Kilauea Energy Partners for a Power Purchase Agreement for the geothermal/cable project. Members of the Kilauea consortium include Mission Energy Company,

Fuji Electric, Sumitomo Corporation of America, Pirelli Cable Corporation, Dillingham Construction Pacific Ltd., and Pacific Turbine Systems.

V. Closing

- A. World wide experience in producing electricity from geothermal energy has shown that the process is one of the most environmentally acceptable methods of generating power on a large scale basis. Both the U.S. Department of Energy and the California Energy Commission consider the production of electricity from geothermal energy to be environmentally cleaner than production from oil or other fossil fuel sources, especially concerning the issue of air quality.

The designation of geothermal resource subzones together with other established statutes and regulations, are intended to facilitate the orderly development of geothermal energy in Hawaii. Towards this end, it is the goal of our Department to insure that exploration, development, and production of electricity from geothermal resources takes place in consonance with our State's energy goals and our responsibility to preserve Hawaii's unique social and natural environment.

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SPEECH OUTLINE

- I. Introduction
 - A. Hawaii's dependence on oil and the State's energy policy promoting the transition to alternate energy sources.
 - B. State's objective to maintain a balance between geothermal development and the preservation of the environment.
- II. Background
 - A. The State's initial exploration efforts which resulted in the successful drilling of the 3 megawatt HGP-A well in 1976 near Pohoiki, on the island of Hawaii.
 - B. Prospects for large-scale geothermal development led to the Geothermal Resource Subzone Assessment and Designation Act passed by the 1983 Legislature.
 - 1. DLNR initiated a statewide assessment of geothermal potential for each county which was conducted by a Geothermal Resource Technical Committee.
 - 2. After several public hearings and contested case hearings (4) areas (3 on Hawaii, 1 on Maui) were designated as Geothermal Resource Subzones (GRS) totaling approximately 26,000 acres.
 - C. In addition to the administration of subzone areas, DLNR's regulatory responsibilities include, but is not limited to, the following:
 - 1. The use of lands within the Conservation Districts established by the State Land Use Commission.
 - 2. Administration of (6) Geothermal Resource Mining Leases encompassing approximately 14,000 acres.
 - 3. Review and permitting of all proposed geothermal exploration and development activities.
 - 4. Monitoring of geothermal field operations and inspection of geothermal well drilling activity.
 - 5. Administration of the State's Historic Preservation Program which requires Historic Site review of all applicable projects to evaluate the effect of any proposed construction, alteration, or improvement of any nature on historic properties.

6. Providing assistance and information through the Department's Geothermal/Cable Permit Center and coordinating the consolidated interagency permit application and review process for the proposed geothermal/cable project.

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- B. The three geothermal projects that have been permitted and monitored by the Department are:
 1. The University of Hawaii recently completed (3) Scientific Observation Holes (SOH) along the Kilauea East Rift Zone. All of the "slim" holes revealed high temperatures and additional testing may demonstrate that some have good permeability indicative of a potential geothermal resource area.
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 3. As a result of the blowout of geothermal injection well Kapoho State No. 8 (KS-8) on June 12-13, activity at the Puna Geothermal Venture (PGV) project has been temporarily suspended. Although construction of the power plant has resumed, drilling operations have yet to receive the necessary approvals to proceed.

The June 12 blowout incident lasted for 31 hours after drilling encountered a relatively shallow resource at approximately 3,800 feet depth. The blowout required the evacuation of some nearby residents and led to a Proclamation of a State of Emergency issued by the Hawaii County Mayor.

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6. Providing assistance and information through the Department's Geothermal/Cable Permit Center and ~~coordinating the consolidated interagency permit application and review process for the proposed geothermal/cable project.~~

III. Geothermal Activity

- A. Since 1980, (3) geothermal developers (Barnwell Geothermal Corporation, Puna Geothermal Venture, and

True/Mid-Pacific Geothermal Venture) have conducted commercial exploration and development operations in Hawaii. ~~Currently,~~ ^{However, only} (2) remain actively involved - Puna Geothermal Venture and True/Mid-Pacific.

B. To date (12) geothermal (production/injection) wells and (3) Scientific Observation Holes have been drilled on the island of Hawaii. The maximum depths of these wells range from 5,000' to 8,300' in depth. ~~The~~ ^{were} maximum temperatures recorded for these wells ~~are~~ between 400 to over 650 degrees Fahrenheit. The total flow rates (steam and water) for those wells capable of producing geothermal resources ranged from 33,000 to 100,000 lbs/hr.

C. ~~Presently,~~ ^{Currently} three geothermal projects ^{that} have been permitted and monitored by the Department: ^{are} :

1. The University of Hawaii ^{which has} recently completed (3) Scientific Observation Holes (SOH) along the Kilauea East Rift Zone. All of the "slim" holes revealed high temperatures and additional testing may demonstrate that some have good permeability indicative of a potential geothermal resource area.

2. True/Mid-Pacific Geothermal Venture, headquartered in Wyoming, commenced exploratory drilling in late 1989 after an eight year permitting effort that included a land exchange between the State of Hawaii and Campbell Estate. To date, True/Mid-Pacific has drilled a total of (4) holes (1 vertical, 3 directional) from the same well bore and has flow tested one of the directional holes. Most recently,

they have received approval to mobilize to a second well site within the Kilauea Middle East Rift Zone.

3. Since the June 12-13 blowout of geothermal injection well Kapoho State No. 8 (KS-8), activity at the Puna Geothermal Venture (PGV) project has been temporarily suspended. Although construction of the power plant has been allowed to continue, drilling operations have yet to receive the necessary approvals to proceed.

The June 12 blowout incident lasted for 31 hours after drilling encountered a relatively shallow resource at a depth of approximately 3,400 feet. The blowout required the evacuation of some nearby residents and led to a Declaration of a State of Emergency by the Hawaii County Mayor.

Subsequent to the blowout, the State and County jointly initiated independent investigations of the incident, which included a review of drilling equipment and procedures, noise and emission abatement, and monitoring procedures. In addition, a review and evaluation of PGV's emergency response plan was conducted by the Department of Health and the Hawaii County Civil Defense.

Concurrent with the completion of the investigations and the public distribution of the reports, work was undertaken to quench and control well KS-8. Quenching operations included pumping a high volume of water on the order of 1,300 gpm for approximately 26 hours (totaling

approximately 2,100,000 gallons). The injection of water was followed by pumping large quantities of heavy weight drilling mud. Following the weighted mud, cement was pumped into the well through a 7" diameter casing in order to set a cement plug at depth (approximately 3,376'). On October 1, 1991, well KS-8 was officially declared secured and under control.

IV. Current Status *(optional)*

- A. A joint State and County Geothermal Task Force has met regularly since August to develop a Geothermal Management Plan which identifies specific developer and government agency actions necessary to minimize the potential for future adverse impacts to the health and safety of PGV personnel and the residents of nearby communities.
- B. The State has also initiated the preparation of a Master Development Plan for the large scale geothermal/inter-island cable project, overland transmission corridor analyses, an Environmental Impact Statement, and a public information and participation program.
- C. Negotiations are also underway between Hawaiian Electric Company and Kilauea Energy Partners for a Power Purchase Agreement for the geothermal/cable project. Members of the Kilauea consortium include Mission Energy Company, Fuji Electric, Sumitomo Corporation of America, Pirelli Cable Corporation, Dillingham Construction Pacific Ltd., and Pacific Turbine Systems.

V. Closing

- A. World wide experience in producing electricity from geothermal energy has shown that the process is one of the most environmentally acceptable methods of generating power on a large scale basis. Both the U.S. Department of Energy and the California Energy Commission consider the production of electricity from geothermal energy to be environmentally cleaner than production from oil or other fossil fuel sources, especially concerning the issue of air quality.**

The designation of geothermal resource subzones together with other established statutes and regulations, are intended to facilitate the orderly development of geothermal energy in Hawaii. Towards this end, it is the goal of our Department to insure that exploration, development, and production of electricity from geothermal resources takes place in consonance with our State's energy goals and our responsibility to preserve Hawaii's unique ~~social and natural~~ environment.