ENVIRONMENTAL CONCERNS AND PERMITTING CONDITIONS OF THE HAWAIIAN SCIENTIFIC OBSERVATION HOLE (SOH) PROGRAM

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SUMMARY - The Hawaii Natural Energy Institute, University of Hawaii at Manoa drilled three Scientific Observation Holes (SOH) between December 1989 and May 1991 to assess and characterize the geothermal resource potential along a portion of the Kilauea East Rift Zone comprised of rain forest, small farms, and scattered residences in several loosely organized communities, on the Big Island of Hawaii. Great care was taken in selecting the drilling sites, equipment, and procedures to minimize impacts to the environment, and to meet the stringent permitting conditions. This paper discusses permitting conditions and describes the methods and techniques used to successfully complete the Scientific Observation Hole (SOH) program.

1. BACKGROUND

Although considerable geothermal activity and permitting took place on the Big Island of Hawaii during the middle 1970s and early 1980s, by 1988 when the Scientific Observation Hole (SOH) program was initiated, geothermal development was not a major topic of contention. Activity at that time was confined to low profile litigation for permit approval by the True Geothermal Venture (TGV), minor holding activity by the Puna Geothermal Venture (PGV) in anticipation of future corporate development, and the commercial operation of the State owned HGP-A demonstration pilot generation plant at the Noi'i O Puna Geothermal Research Center (PRC).

Past geothermal activity had been characterized by bitter permitting confrontations, litigation, quasi legal contested case hearings, disputed environmental impact statements, and the creation of Geothermal Resource Subzones incorporating unpopular land zoning changes, and resulting in challenged land exchanges and litigation on impacted religious rights. Operations at the HGP-A plant received continuing, but rather minor, complaints regarding the spread of unsightly surface settling ponds for the expended brine, rusting surface facilities, and Occasional, but increasingly common, venting of H_2S due to plant breakdowns and poor maintenance at the abatement facility. Never-the-less, the plant operated at a plant factor of greater than 90% providing between 2 and 3 MW of electricity to the Big Island grid.

Opposition to geothermal development began to rise when the Scientific Observation Hole (SOH) program was announced and initial public information meetings were held in the communities in which the SOHs were to be drilled. Details of the SOH program are described in Olson and Deymonaz (1991). Also, as the permitting process was beginning, litigation involving the land exchange and religious rights was resolved in TGV's favor; and PGV was sold to a consortium with financing to actively pursue development. Shortly following the court rulings TGV mobilized a drill rig from the Mainland, cleared a drill site and access road in the forest, and began preparations to commence the work on the initial 25 MW facility of a proposed 100 MW development. PGV began efforts to complete its permitting for a 25 MW hybrid binary cycle generating facility for which they had an existing steam sales contact with HELCO, the local utility on the Big Island. In addition, the HECO, the Oahu utility, at this time published a Request For Proposals for the development of 500 MW of geothermal energy on the Big Island of Hawaii to provide electricity to the Big Island and to the islands of Maui and Oahu via a deep underwater cable transmission line.

The residents of the Big Island were rather suddenly faced with the perceived prospect of massive energy development and industrialization of the largely rural community in the Puna District, and began mobilizing opposition to this recognized threat to their existing easy going lifestyle. The State and County institutions and regulators at this time were untrained and inexperienced with geothermal development, and were poorly organized, staffed, and equipped to effectively deal with the pressures of the developers for timely decisions and the increasing onslaught of misinformation, half-truths, half-science, non-science, social concerns, hidden agendas, accusations, and politics by well organized, educated, highly sophisticated, and media-wise opposition groups.

Permitting for the SOH program took place in this rapidly evolving increasingly confrontational environment.

2. PERMITTING

In general, permitting for geothermal activities in Hawaii State and County must obtain approval from the following lead agencies:

- DEPARTMENT OF HEALTH (DOH), OFFICE OF ENVIRONMENTAL QUALITY CONTROL - evaluates the environmental sensitivity of the project and determines if an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) will be required.

State regulations provide that research projects which involve temporary, casual land usage are not required to submit an EA or EIS, and only need to provide documentation that the land impacted does not contain rare or endangered species, archeological sites, etc. However, State regulations also provide that an EA or EIS are required for geothermal activities. As geothermal development in Hawaii is controversial, State regulators and politicians determined that an environmental study would be required. Consequently, the University of Hawaii submitted a determination that an EA would be sufficient, which was accepted - probably because it was over looked by the opposition and not contested. This probably will not happen again, and, realistically, EISs will bc required on any future projects.

- DEPARTMENT OF LAND AND NATURAL DEVELOPMENT (DLNR)- evaluates the technical aspects of the project and determines the technical conditions of the permit and land usage conditions on property classified as Conservation Land. Although initial permitting required considerable time and education of the DLNR Board which reviewed the permit applications, permit conditions, although stringent, were essentially straight forward and reasonable.

- COUNTY OF HAWAII PLANNING COMMISSION - evaluates permitted activities with regard to social impacts, land usage plans and provisions, zoning regulations, etc., and determines operational conditions on property classified as Residential and Agricultural. County regulations require that approval be given to any projects in which the permitting process takes longer than 180 days, but this regulation, in practice, is not enforceable as the Planning Commission can indicate that the permit will not be approved unless additional deliberation time is approved by the entity seeking the permit. County regulations also provide for "Mediation", if requested, in the event that the permit application meets considerable opposition. SOH application hearings were contentious, one meeting was recessed until the police were called to provide security for the Commissioners, after they had been physically threatened by a member of the opposition, and mediation was requested. The mediation was often heated, did not involve any concessions by the opposition, and was used by the opposition only to voice greater demands, to obtain further operational restrictions, and to harasses the project managers. A local driller, who was not selected in the bidding process, was able to require a drilling and casing plan more suitable to full scale production wells then to scientific observation holes. The Geothermal Resource Permit application, when finally approved, contained 3 general and 26 specific conditions (1989). Although many of the conditions were straight forward and reasonable, the remaining conditions served only to increase the regulatory burden, reduce operational flexibility, and to raise overall project costs, while adding little to the efficiency and safety of the project.

General permit conditions are as follows:

1) Geothermal development activities will not have unreasonable adverse health, environmental, or socioeconomic effect on surrounding residents or property, and that:
   - the drill sites will not exceed approximately 1/4 acre in size;
   - ground water will be protected by casing to sea level;
   - sites will be relocated to avoid endangered species and archeological sites, or to cause undesirable impacts;
   - geothermal emissions will not be vented to the atmosphere;
   - sites will bc located to take advantage of natural conditions to minimize impacts on local residents; and
   - drilling sites will be designated as "hard Hat" areas to which the general public is excluded.

2) Geothermal development activities will require no provisions from public agencies to provide roads and streets, sewers, water, drainage, or school enlargement or improvements, and only the normally afforded police and fire protection will be expected. Any necessary access roads will be constructed by the SOH program, and all drilling water will be purchased or supplied by the driller.

3) Environmental, noise, and H_2S monitoring will be conducted at all times during drilling operations and will comply with all Federal, State, and local rules regarding environmental monitoring.

Specific Permit conditions are as follows:

1) The SOH program will comply with all of the conditions of approval.

2) Prior to any grubbing or grading activity:
   a) site and access boundaries will be marked and no equipment allowed outside of the boundaries.
   b) submit an archaeological reconnaissance survey and an endangered flora and fauna survey to the Planning Department for review. This provision was further strengthened by DLNR conditions which required an archeological survey of an area of thick forest 2,500 feet by 1,435 feet, the total area of which was covered by walking lines separated by 30 feet, surrounding the site on Conservation land. Conditions also require that if lava tubes 6 feet in height were encountered within 100 feet of the surface during drilling, that operations be stopped until an instrument could bc lowered into the tube to determine if the tube was a burial site.
   c) comply with requirements of the County grading ordinance.

3) Prior to any drilling activity, submit to County Planning Department for approval a noise monitoring plan with

provisions for initiating monitoring at the drill sites at least one week prior to start of drilling, coordination of noise complaints with noise measurements, and one mobile noise monitor to do site specific monitoring.

4) Prior to any drilling activity, submit to Planning Department for approval an air quality monitoring plan to be implemented at the initiation of drilling which will be operational during all phases of the project.

5) Prior to any drilling activity, submit an emergency plan to the Hawaii County Civil Defense Agency for approval with provisions for coordination with State and County officials, on site safety precautions, and the evacuation of affected individuals in the event of an emergency. Although seemingly reasonable, this provision caused lengthy delays in preparing the permit application due to unreasonable hold ups in reviewing the emergency plan, frequent changing of provisions that had been approved, and unrealistic definitions of impacts resulting from possible drilling mishaps.

6) Maintain a permanent record and provide five copies of the record to the Planning Department of drilling activities, and the performance, maintenance, testing, and measurements of the emission monitors.

7) Apply "Best Available Control Technology" in all phases of drilling activity for geothermal emissions.

8) Prohibit unabated open venting of geothermal steam. This was interpreted by the Planning Department to include the flowing or pumping of geothermal fluids to the surface, and effectively excluded the collection of ground water and reservoir samples.

9) Conduct continuous meteorological monitoring at the sites including temperature and wind velocity and direction.

10) Publish a telephone number at the drill site for local residents to call in noise and odor complaints. This condition was used by some local residents to harass the drillers and disrupt drilling operations. This problem was partially solved by retaining an individual with a mobile phone, on a 24 hour a day basis, to respond to local complaints. Most complaints related to the ability to hear rig noises, and not that noise guidelines were being exceeded. Early morning harassment calls to the project manager continued throughout the project.

11) Submit five copies of a drilling status report, including a financial accounting, to the Planning Commission on a quarterly basis. One of the strategies of the opposition was to increase the cost of activities to limit the quantity of work and to shorten or terminate the program.

12) Do not exceed a general noise level measured at a residence "receptor" of 55 dBA during daylight hours, and 45 dBA during the night. For practical purposes a "receptor" was defined as a monitor at a complaining neighbor. To provide for "spike" noises such as the clanging of pipes or "revving" of the diesel motor while tripping, a provision allowed that the guidelines could be exceeded by 10 dBA for not more than 2 minutes during any 20 minute period. Noise guidelines were not exceeded throughout the entire program, but were the cause of continual harassment as the opposition called in noise complaints every time rig noises could be heard, in order to increase costs related to verifying the complaints and to establish a record of noise impacts. At the rig, continual efforts were made to reduce noise impacts of any kind by aligning the rig to direct the broadcast of sound away from the neighbors most likely to be impacted, construction of noise barriers on and around the rig, and scheduling or canceling high noise emitting rig activities such as tripping or cementing, to minimize noise impacts at night.

13) Dispose of sump contents at a site approved by the State Department of Health (DOH).

14) Analyze and dispose of sump contents in a manner approved by the State DOH. The SOH sump contents contained no toxic materials and the DOH allowed the sumps to be closed by burying the contents beneath a layer of cinder.

15) Restore the SOH sites in a manner meeting with the approval of the Planning Department and the property owners upon completion or abandonment. All SOH sites are on private property, and, at the request of the property owners, restoration has been limited to closing of the mud sumps.

16) Allow unrestricted access to the drill sites and operations by all authorized governmental representatives.

17) Limit large vehicle traffic to daylight hours between 7:00 a.m. and 7:00 p.m. This condition, at times, severely restricted drilling activities and increased costs. During night time rotary drilling at SOH-4, lack of water required shutting down the rig until water could be delivered in the morning. This problem was partially solved on subsequent SOHs by securing a local source of water that did not require haulage.

18) Comply with the County of Hawaii Outdoor Lighting Code so that rig lighting will not interfere with operations at the observatories located on Mauna Kea.

19) The geothermal resource drilling permit will be effective from August 15, 1989 until December 31, 1991.

20) The SOH program will comply with all other applicable rules, regulations, and requirements, including those of the Hawaii County Department of Water Supply, and the State DOH and DLNR.

21) The geothermal resources drilling permit may be extended for a period not to exceed one year without resubmission to the Planning Commission.

22) If the County water well near SOH-2 is used as a source of drilling water, the well will be monitored for increases in the saline content.

23) Within 48 hour after an earthquake registering 6 or above on the Richter Scale or after an eruption has occurred, all SOHs within 10 kilometers of the activity will be examined for any physical changes that would alter its downhole integrity. No events occurred during the SOH program, but examination of the holes would have been limited to plumbing the SOHs and taking temperature and pressure measurements with Kuster instruments, due to the unavailability of logging instruments and crews on such short notice.

24) Each SOH will be surveyed to determine the precise location of the pipe string to facilitate its plugging in the event of a blowout. It was not possible to log bottom hole locations of SOH-2 and SOH-4 due to instrument failure

caused by high downhole temperatures. An adjacent property owner at SOH-2 accused the project of drilling under her property, but the existing survey was able to prove that to the depth measured the hole was angling away from her property.

25) SOH-4 will be drilled first and a status report of drilling activities through the setting of the surface casing, submitted to the Planning Commission for review to verify compliance of the initial drilling activities, prior to drilling below a depth of 200 feet at the next SOH. This provision was imposed because the opposition convinced the Planning Commission that the drilling activities could not operate within the permit conditions. Although the status report was submitted to the Planning Commission after the casing was set, the Commission did not get around to reviewing the report at a public meeting until after the rig had set up on the SOH-1 site and drilled to a depth of 200 feet. This caused the rig to be shut down for a period of nearly a week and incurred down time charges of about $30,000.

26) The Planning Director may temporarily suspend the permit for non compliance of the permit conditions.

3. DISCUSSION

The Hawaii Natural Energy Institute, University of Hawaii at Manoa successfully drilled three Scientific Observation Holes between December 1989 and May 1991 to assess and characterize the geothermal resources potential along a portion of Kilauea East Rift Zone in an area comprised of rain forest, small farms, and scattered residences in several loosely organized communities, in the environmentally sensitive and developmentally opposed Puna District of the Big Island of Hawaii. The program was able to be completed because great care was taken in selecting the drill sites and drill rig, to be as unobstusive as possible within the areas to be tested, and to be as small and quiet as possible while still having the capability to drill to the targeted depths. Great care was also taken in selecting a drilling company with a record of environmental sensitivity and compliance, and a highly competent staff of drillers and supervisors who were instructed as to the environmental sensitivity of the program and the need for caution and common sense in the drilling practices. The rig was further modified prior to mobilization to the project site to reduce operational noise, and at each site noise surveys were taken so that noise buffers could be strategically located to reduce noise impact to a minimum.

Never-the-less, even with a record of program accomplishments while successfully meeting the permit conditions, future programs probably will be more difficult to fund and permit, because of the intense opposition to geothermal development by the vocal minority. Although this opposition is carried under the guise of public safety, the environment, and native Hawaiian rights and religion, the real issues are "not in my backyard" (NIMBY), "locally unpopular land development" (LULU), and more importantly social and political control. The case for energy development has passed beyond the realm of science and fact, and is now being argued in terms of perception and politics, and sadly enough the techniques of opposition are now sophisticated enough and the democratic process subverted to the point that most projects can be stopped even though the project is permitted and in compliance with all conditions. The current geothermal development by PGV on the Big Island probably will be successfully completed and operated, but further development of Hawaii's most abundant indigenous natural energy resource, may have to wait until radical changes occur in the present political and regulatory environment.

4. ACKNOWLEDGMENTS

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5. REFERENCES

County of Hawaii Planning Commission, 1989, Geothermal Resource permit Application (GRP89-1), Hawaii's Scientific Observation Hole (SOH) Program, Lilewa, Kapoho, and Halekamahina, Hawaii: TMK: 1-2-10:01; 1-4-01:2; and 1-4-02: 32; Certified Letter, 15 Aug. 1989.

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