Attachment A

REVIEW OF DAMES AND MOORE REPORT

The report entitled "Evaluation of BACT and Air Quality Impact of Potential Development in Hawaii", EPA Contract 68-02-3508, has been indicated as the primary basis for the proposed air quality regulations by the State of Hawaii Department of Health. In order to better understand the basis which exists for the proposed regulations, PGV initiated a review of the Dames and Moore report. This review concentrated on factors related to establishing an emission standard for the State of Hawaii and resulted in the following observations.

The report is based upon the following bases, assumptions, and qualifications by Dames and Moore:

- Information describing H_2S abatement control technologies relies primarily upon data gathered at The Geysers geothermal area in California.
- The primary source of information for the geothermal resource in Hawaii is experience at the HGP-A project. Thus, a level of 1,000 ppmw H_2S in the steam is assumed.
- Partitioning is assumed to be 90 percent. If higher partitioning is achieved, greater H_2S removal would occur at the Stretford. If lower partitioning occurs, greater H_2S removal will be required of the H_2O_2 secondary system. This would require higher chemical feed rates and would result in more expensive H_2S removal.
- The air quality analysis is for one geographic district in Hawaii and does not address the implications of geothermal development elsewhere in the State of Hawaii.
- A change in the assumptions regarding the geothermal resource in Hawaii could impact the recommended emission control systems and subsequent H_2S emission rates.
- BACT must consider energy, environmental, and economic impacts. The determination of BACT is made on a

case-by-case basis. Individual projects having different emission control impacts can have different emission control technologies defined as BACT. In addition, BACT will change with time as more data becomes available.

The following comments reflect upon the usefulness of the report to establish an H_2S emission standard for the State of Hawaii:

- The report is generally well done and internally consistent, but its limitations are not clearly identified in the context of the BACT recommendations it makes for the power plant. The largest limitation is that the report does not address what the BACT or abatement level should be for a resource having a different H_2S content or a resource chemistry that results in a different level of partitioning.

- The estimated cost of abatement given in Table 7.0-9 is 6.8 mills/kWh or $1.2 million in 1981 dollars. Bechtel received quotes from three vendors in 1983 for a Stretford system designed to similar criteria. The quotes ranged from $3.0 million to $3.7 million, excluding foundations, site work, and connecting utilities. Different cost assumptions can change the technology judged to be BACT.

- The Dames and Moore estimate is based upon a factored estimate of a value reported for the Pacific Gas and Electric Company's Unit 16. The cost of that Stretford system was reported to be $1.6 million. However, this value is inconsistent with other costs reported by PG&E and others, for example:

  - The cost of the Stretford system for the NCPA No. 2 power plant at The Geysers was approximately $2.0 million (1979 dollars) for a 110 MW plant.

  - The Application for Certification (AFC) submitted by PG&E for their 110 MWe Unit 21 indicates a cost of approximately $15 million (1984 dollars) for the Stretford system.

  - The enclosed paper by PG&E for a generic 110 MWe plant indicates a Stretford system cost of $6.8 million (1984 dollars) to treat 230 lb/hr of sulfur.

The above data base by itself is not sufficient to predict the cost of the Stretford system for a plant in Hawaii. But, it is obvious that the costs upon which Danes and Moore based its estimate (PG&E Unit 16) are at the extreme low end of published values for similar plants.

The report assumes that a 90% partitioning is achievable with the Hawaii geothermal resource. This is based upon statements that the latest PG&E units are achieving up to 95%. In a recent contact with PG&E's Department of Engineering Research, it was learned that these plants generally operate in the 80% to 90% partitioning range, not 90% to 95%.