

UNIVERSITY OF UTAH RESEARCH INSTITUTE

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May 30, 1979

Mr. John Griffith
Department of Energy/ID
550 2nd Street
Idaho Falls, ID 83401

Dear John:

I have reviewed a statement entitled the "Geothermal Energy Exploration Program for Williams Air Force Base, Maricopa County, Arizona" by W. Richard Hahman, Sr. of the Arizona Bureau of Geology and Mineral Technology. I have also called Mr. Hahman to discuss his evaluation of the resource and his understanding of the constraints on exploration at Williams Air Force Base. My comments and recommendations follow:

It is understood that EG&G engineering studies indicate that 240°-250°F fluid temperatures are required to drive heat pumps for the chillers of the air conditioning system. These temperatures were found at depths of 7500-8500 feet in the G.K.I. No. 1 and No. 2 Power Ranches Wells, and in the absence of other data these depths must be considered the minimum necessary to produce fluids of the desired temperatures on the Williams Air Force Base proper. The rock types intersected by the Power Ranches Wells at these depth include volcanic tuff and possibly altered igneous rocks below 9200 feet. A geothermal reservoir in these rock types would require substantial fracture permeability and cannot be considered as a layered, continuous media such as the overlying alluvium, evaporites or Tertiary sediments. These considerations place major geologic requirements on the siting of drill holes. Even though the reservoir area may have adequate temperatures, the drill hole must penetrate substantial fracture and/or fault zones to produce fluids at the rates required.

Hahman notes two major constraints upon the selection of well sites; 1) the site must be within the boundaries of Williams Air Force Base, and 2) the site must be such that a large drill rig and well installation would not conflict with the operation of major base facilities. These were important considerations for Hahman in forming recommendations for an exploration program at Williams Air Force Base. His recommendations are for no additional exploration work prior to drilling two production wells and a reinjection well at a cost in excess of \$2,000,000.

It is most important to identify that this is a very high risk exploration project. The chances of intersecting suitable permeability at the

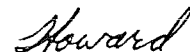
target depth with so few holes are reduced by the constraints on well siting and the lack of adequate subsurface data for well siting. Although the No. 1 and No. 2 Power Ranches wells initially produced fluids the flow soon ceased and attempts at stimulation failed. Hence a producing reservoir has not been demonstrated. Hahman's well site WP-1 is the closest on-base location to GKI-#2 and GKI-#1, and on the basis of proximity is most likely to intersect a similar geologic setting. A preliminary evaluation of an incomplete suite of geophysical well logs for these holes does not indicate major fracture characteristics from depths of 7500 feet to the bottoms of the logged intervals at about 9100 feet (W.E.Glenn, ESL/UURI, Personnel Communication). Furthermore, the geologic controls on the area of high temperature at depth--the location and shape of this area--are not known. Well site WP-2 is an added 7500 feet northeast and is clearly a 'wildcat' sited on engineering and space available considerations. I see no need for an injection well, WR-1, to be located so far from the potential production zone.

I agree that only drill testing will indicate the fracture porosity at 10,000 feet. There is some possibility that a reflection seismic survey would delineate major structural features which have the greater probability of fracture permeability. An expenditure of the order of \$100,000 for 10-15 line miles of seismic data is recommended to attempt to detect deep structure in view of the anticipated high drilling costs for deep production holes.

In summary, I recognize the difficult exploration problem at Williams Air Force Base. I do not believe that a producing reservoir has been demonstrated. I feel that any drill program of this magnitude should not be undertaken without state-of-the-art seismic control at a small fraction of the cost of drilling. Without additional control the site recommended for WP-1 is the most likely choice. Temperatures of 240^o-250^oF may be achieved at depths of 8000 feet but fractures must be intersected to achieve a substantial fluid flow and this may require additional depth. Where there is no guarantee of high temperatures at depths of the order of 10,000 feet beneath the base, this must be considered a high risk program where one production well out of three holes drilled would be a realistic expectation.

Please call me for clarification of any of these statements.

Sincerely,



Howard P. Ross
Senior Geophysicist

HPR/smk

cc: W. D. Gertsch, EG&G
Clay Nichols, DOE/ID
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