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MEMORANDUM

May 9, 1984

TO: Clay Nichols and Sue Prestwich
FROM: UURI
SUBJECT: Thoughts on Cascades Cost-Shared Drilling Program

This memo discusses some potential philosophies for the Cascades Cost-Shared Drilling Program.

OBJECTIVE

We believe that the basic objective of the program must be an industry-oriented one, rather than one directed more along scientific lines. We suggest the following:

Objective: To stimulate discovery and development by industry of high-temperature geothermal resources in the Cascades province.

In order to stimulate development in the Cascades, the biggest problem to be overcome is in finding effective means to explore for and discover resources there.¹ Therefore, the program should not be limited to drilling,

¹ At the direction of Ron Toms, development of exploration technologies is not a funded activity in the Reservoir Definition Program plan, but it is clear that such research is needed to assist industry in the Cascades as well as elsewhere.

but should embrace a carefully formulated research program based upon testing various exploration and reservoir definition techniques against the ground truth that the drilling data will provide.

STRATEGIES

In order for the program to achieve maximum success, it will be necessary that significant geothermal temperatures (> 90 °C) be found in at least one test hole. This requirement would dictate that the maximum number of holes be drilled to the maximum depth in the best areas as presently known. Such a goal is not financially compatible, however, with obtaining an acceptable amount of scientific information from the holes. At minimum, the holes will require proper logging, casing, and completion in order to preserve them in an appropriate condition for subsequent experimentation. This means that an idea of experiments that are likely to be run on the holes is needed now so that logging, casing and completion can be specified. Leaving the holes in good condition for subsequent experiments will be costly, but not so costly as the experiments themselves.

We suggest that the Cascades Program needs to be viewed as a two-year program at minimum. This would allow the following strategy:

- FY 85 - Spend the maximum amount possible on drilling, logging and completing the holes.
- FY 86 - Perform appropriate experiments on the holes. Deepen selected holes, if necessary. Drill new holes as appropriate.
- FY 87 and beyond - The program could conceivably go through several phases of drilling and experimentation.

Several other items of strategy need to be considered. One such item is the following: It is unlikely that we will know for sure during drilling when

we have drilled below the zone of cold-water overflow. It is considerably less likely that we will know how deep to drill at the outset, before drilling starts. We are therefore in the position that we may be discouraged by our results at a site which actually has a resource at depth simply because we have not drilled deep enough.

The question is, do we pick, say, 2 sites and drill and log until we are satisfied that we are below the "rain curtain", even though it may cost more than we hoped, or do we commit to spend a certain fixed amount, say \$150K (with an additional \$150K from the participating company), on 7 sites and take what we get? This question needs to be thoroughly explored before the SCAP is written--it affects the entire program.

PARAMETERS TO BE DEFINED BY PROPOSERS

Assuming that a maximum of the FY 85 funds will be spent on drilling and appropriately preserving the wells and that scientific work will be funded in FY 86, at least the following parameters need to be defined or limits placed in the solicitation so that the FY 85 program is properly done:

Hole Diameter and Casing Program. The larger the hole, the more costly.

However, if the diameter is too small, deepening may be impossible and installation of a pump may be precluded. The SCAP should specify potential experiments to be done later and that some evaluation criteria will be based on an adequate drilling and casing program that results in a hole useful for future purposes. The SCAP should also specify that we need to know the level of the water table at proposed each site (if known).

Logging. We believe that the wells should be commercially logged. This way, a certain expenditure will more or less guarantee us usable logs. We suggest a conservative logging program, but one to include not less than caliper,

temperature, resistivity, ^γSP and perhaps ^γsonic velocity or neutron density or ^γteleviwer. These logs are designed to measure temperature and detect fractures rather than map lithologies. We will know the lithology well enough from chip logging.

Core Intervals. Obviously coring the entire well would be scientifically valuable, but perhaps not cost effective in terms of getting the most hole for the money. The question of how much to core and its cost should be looked at before the SCAP is written so that general guidelines can be given.

Site Selection. The concept that the best possible sites must be prioritized and drilled from highest priority to lower seems acceptable to all. The selection committee that DOE is setting up should help to ensure this.

ROLES OF GOVERNMENT ORGANIZATIONS

Clearly, UURI and the States will overlap to some degree in what we would propose to do. There will also be some overlap with the USGS. Here are our tentative suggestions:

1. USGS. Their role should be primarily in hydrology, since this will be important to site selection and subsequent drilling and they have strengths here. Ed Sammel will be a big help, and we may also want to get some of Mike Sorey's time, too.
2. States. We suggest that the States be heavily involved in site selection, that they log the drill chips/core during drilling and that they help provide supplementary data for drill site selection as needed. A split of the chip/core samples should go to the States.
3. UURI. We suggest that UURI be involved in site selection, provide technical liaison between drillers and loggers and DOE, provide mineralogic and X-ray work on samples as needed, collect water samples

and provide chemical analyses as needed and collect and open file all of the data. A split of the chip/core samples would be stored in the Geothermal Sample Library. UURI can also provide supplementary data collection if needed. *Mag Susceptibility; Log compilation & interp.*

4. LBL. We suggest that LBL be needed in site selection only. Since as ? scientific work is likely, unless funded out of SAN's reservoir definition program, they probably can't contribute beyond this.

AGREEMENT WITH PARTICIPATING COMPANIES

We suggest that DOE agree with participating companies as follows:

1. DOE will put up a contaminant per hole or drill with certain set objectives are met. The participating company will be expected to match this in money or in kind. ?
2. The holes will be drilled, cased and completed as appropriate under contracts issued by the participating company. The participant will be responsible for logging contracts, and a minimum logging program, as agreed with DOE, will be performed.
3. All data generated by the cost-shared drilling will be in the public domain after a 6-month confidentiality period (no confidentiality period unless the participant requests it).
4. The participant is welcome to do work beyond his commitment, and if such work is done within 12 months of the DOE cost-shared drilling, DOE will have rights to certain of the data thereby generated, as agreed with the participant. ✓
5. Chip samples will be collected by the drilling contractor as agreed to with DOE, and made available to UURI and to the state geologic team.
6. More favorable evaluation will be given to those companies that put a

larger or more meaningful data package to be released into the public domain than to those who release little.

7. Promises of cooperation with government representatives and researchers will be favored in evaluation of proposals. This concept could be explored to include favorable evaluation to those ^{who} also proposed to actively work with government research, i.e. contribute staff time and data to research objectives.