

GLO1832



Department of Energy

Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

July 12, 1984

Mike Wright
Earth Science Laboratory
391 Chipeta Way, Suite C
Salt Lake City, UT 84108

Subject: Technical Advisory Committee to the Source Evaluation Panel for
the SCAP for Cascades Regional Thermal Gradient Drilling

Dear Sir:

You are hereby requested to serve as a member of the subject Committee. No arrangement has been made for reimbursement by DOE of salary, travel or other costs which may be incurred as a result of your appointment. Enclosed is a Statement of Confidentiality and Freedom From Conflict of Interest which must be executed by you and returned to me prior to your participation in any Committee activities. Prior to signing this Statement, you are requested to contact E. M. Hyster on 208-526-1229. By returning the executed Statement to me, you are accepting appointment to the subject Committee with the conditions and restrictions imposed by this letter and the enclosed Statement.

I recommend that you keep a copy of your executed Statement for your own information and future reference.

Should you decide not to accept the appointment, you are requested to return the enclosed Statement to me unsigned.

Sincerely,

E. M. Hyster for

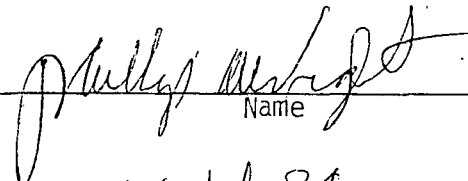
T. A. Hart, Chairman
Source Evaluation Panel

STATEMENT OF CONFIDENTIALITY AND FREEDOM FROM CONFLICT OF
INTEREST FOR TECHNICAL ADVISORY COMMITTEE
ACTIVITIES ON THE SOLICITATION FOR COOPERATIVE AGREEMENT PROPOSALS
FOR CASCADES REGIONAL THERMAL GRADIENT DRILLING

In anticipation of my participation on the Technical Advisory Committee to the Source Evaluation Panel formed for the subject SCAP, I certify that I will not disclose any information either during the proceedings of the Committee or any subsequent time concerning the evaluation of proposals or other activities of the Committee to anyone who is not also participating in the same proceedings and then only to the extent that such information is required in connection with such proceedings. Furthermore, I will report to the Chairman of the Panel any communication concerning the SCAP or the Panel's or Committee's composition and activities directed to me from any source outside the Panel and Committee.

I also certify that to my knowledge neither I, my spouse, minor children, nor any member of my immediate family has any stock, bond, or other financial interest in, or any employment arrangement with any person, firm, or other organization which has submitted a proposal or otherwise has an interest in the project which is subject of the SCAP. I also agree that in the event that subsequent to the execution of this certification by me, any person, firm, or organization in which, to my knowledge I (including my spouse, minor children and other members of my immediate household) have a financial interest or with which I have (or had) an employment arrangement, submits a proposal or otherwise becomes involved in the subject project, I will notify the Chairman of the Panel, and thereafter, until advised to the contrary, I will not participate further in any way, by rendering advice, making recommendations, voting, or otherwise in the work of this Committee.

I agree to use information contained in proposals which I receive for evaluation only for DOE evaluation purposes and to treat the information obtained in confidence. This obligation shall not apply to information obtainable from any source, including the proposer, without restriction. Any notice or restriction placed on the proposal by either DOE or the originator of the proposal shall be conspicuously affixed by me to any reproduction or abstract thereof and its provisions will be strictly complied with. Upon completion of the evaluation, I will return all copies of the proposal and abstracts, if any, to the DOE office which initially furnished the proposal for evaluation. Unless authorized by the Panel Chairman, I will not contact the originator of the proposal concerning any aspect of its contents.



Name

16 July 84

Date

SOURCE LIST - CASCADES

1. Occidental Geothermal
Bob Crewdson
5000 Stockdale Highway
Bakersfield, CA 93309
2. Phillips Petroleum Co.
Dave Reese
655 E. 4500 So.
Salt Lake City, UT 84107
3. Union Oil Co.
Richard F. Dondanville
P.O. Box 6854
Santa Rosa, CA 95406
4. California Energy Co., Inc.
James Moore
3333 Mendocino Ajve. #100
Santa Rosa, CA 95401
5. GRI Operator Corporation
Chan Swanberg
545 Middlefield Road #200
Menlo Park, CA 94025
6. Trans-Pacific Geothermal, Inc.
Tsvi Meidav
1419 Broadway
Oakland, CA 94612
7. Grace Geothermal Corp.
C. W. Berge
970 E. 4800 S.
P.O. Box 17580
Salt Lake City, UT 84117
8. Steam Reserve Corporation
Dean Pilkington
1707 Cole Blvd.
Golden, CO 80401
9. Hunt Energy Corp.
Roger Bowers
2800 Thanksgiving Tower
1601 Elm
Dallas, TX 75201
10. Gertsch and Associates
Gus Gertsch
Route 5, Box 195
Idaho Falls, ID 83401
11. Sunedco Geothermal
12700 Park Central Place
Suite 500, Box 9
Dallas, TX 75251
12. Thermal Power Co.
Joe Iovenitti
601 California St.
San Francisco, CA 94108
13. Nevin Sadlier-Brown Goodbrand
Brian Fairbank
134 Abbott St. #401
Vancouver, British Columbia
CANADA V6B 2K4
14. Chevron Resources Co.
P.O. Box 7147
San Francisco, CA 94120
15. Kennecott
2300 W. 1700 S.
Salt Lake City, UT 84119
16. Roald Bendixen
U.S. DOE
915 2nd Avenue
Seattle, WA 98104
17. Seattle City Power and Light
Richard Richards
105 3rd Ave.
Seattle, WA 98104
18. Eureka Resources
Phil Watson
215 Market Street, Room 260
San Francisco, CA 94106
19. Geothermex, Inc.
Jim Koenig
5221 Central Ave. #201
Richmond, CA 94804
20. Bonneville Power Authority
W. B. Huffman
P.O. Box 3621
Portland, OR 97208
21. Columbia Geosciences

- Al Waibel
22495 NW Quatama Road
Hillsboro, OR 97123
22. O'Brien Resources
William Long
154 Hughes Road
Suite 4
Grass Valley, CA 94945
23. Republic Geothermal, Inc.
Jerry Hutterer
P.O. Box 3388
Santa Fe Springs, CA 90670
24. Anadarko
Bob Edmiston
835 Piner Road #A
Santa Rosa, CA 95401
25. Aminoil, Inc.
Tom Box
P.O. Box 11279
Santa Rosa, CA 95406
26. NORNEV Group
27. Barnwell Industries Inc.
Andrew F. Blumenthal
425 E. 58th St.
New York, NY 10022
28. Ben Holt Associates
Ben Holt
201 S. Lake Avenue
Pasadena, CA 91101
29. Berkeley Group Inc.
2000 Center St.
Suite 108
Berkeley, CA 94704
30. Well Production Testing
Robert Nicholson
P.O. Box 69
Carlsbad, CA 92008
31. Burlington Northern Railway
32. U.S.G.S.
345 Middlefield Road
Menlo Park, CA 94025
33. Energy Systems Inc.
- John Beebee
P.O. Box 6065
Anchorage, AK 99502
34. True Geothermal Energy Co.
Hank True
P.O. Box 2360
Casper, WY 82602
35. Golder Associates
Dennis Goldman
224 West 8th Avenue
Vancouver, B.C.
CANADA V5Y 1N5
36. Alberio Ltd.
Art Lange
257 Alpine Ave.
Golden, CO 80401
37. Morrison-Knudsen
Roy Mink
2 Morrison-Knudsen Plaza
Box 7808
Boise, ID 83729
38. State Teams
39. Munson Geothermal
Stephan Munson
1290 1380 Lawrence
Denver, CO 80202
40. BDM Corp.
Ed DiBello
1801 Randolph Road, S.E.
Albuquerque, NM 87106
41. Anderson & Kelly
Jack E. Kelly
6700 Emerald St.
Boise, ID 83704
42. Bechtel Group Inc.
Vic Vandermeer
P.O. Box 3965
San Francisco, CA 94119
43. Parsons
44. Washington Public Power Supply

Procurement Plan
for Cascade Drilling

A. Acquisition Background and Objectives:

1. Acquisition of Need

The geothermal budget request for FY 85 provides \$1,000,000 for cost-sharing a series of deep heat flow holes with industry participants. The purpose of these holes is to characterize the geothermal resources of the Cascades region.

The intent of this procurement is to cost-share drilling on a 50/50 cost-shared basis between DOE and industry participants. It is therefore recommended that a Solicitation for Cooperative Agreement Proposal (SCAP) be implemented culminating in cooperative agreements.

2. Applicable Conditions

The amount of DOE participation per cooperative agreement shall be \$150-\$200K. This amount is dependent on the need to buy prior resource data through the development of the solicitation SOW and technical requirements.

Schedule constraints require the solicitation be to prospective proposers such that selection and awards can be made October, 1984. The actual drilling should be completed prior to the end of FY 85.

The solicitation shall develop technical requirements which shall ensure adequate hole depth, engineering, and maximum access to the hole and information derived from the hole.

3. Cost

A maximum of \$1,000,000 is allocated for this solicitation. The solicitation shall be structured to allow for 50/50 cost sharing with industry participants. Based on the assumption that each hole will cost approximately \$300K, then DOE shall cost share to a maximum of \$150K per hole drilled.

DOE would like to obtain any other geologic, geographic, geochemical, or well data the participant would make available to extend knowledge of the region drilled.

DOE also will request that each hole be left in a condition to allow for subsequent experiments after completion for a period of time that would extend into the FY 86 funding period to allow for experiments.

These two items could be covered by additional DOE cost sharing up to \$200K per hole (an additional \$50K). However, these should be optional items which could enhance a proposal in the selection process. Based on an assumed \$200K per well, selection of 5-6 proposals is expected.

4. Capability

A participant's capability to financially support his/her share of the project is imperative. The participant must be capable of operating a drilling project such as this and have access to the site to be drilled through a base agreement or other form of ownership. The participant must be willing to allow DOE to make data available to the public.

5. Performance-period Requirements

Should selection, negotiation and cooperative agreement signing occur fall FY 85, we would anticipate work to be completed in late summer or early fall 1985. There would then be a 6-12 month period following where holes are available for further experimentation. We would prefer all holes completed during FY 85 with additional experiments during FY 86 to fit with the geothermal funding cycle.

6. Trade-offs

7. Risks

There is always risk of not completing a hole while drilling. This is inherent to drilling. The SCAP requirements and following selection process shall be structured such as to assure competent drilling and hole construction practices. Both time and cost contingencies must be a part of all well costs; 25% is not unreasonable.

Should failure to complete the well occur early, then an option would be to redrill the hole as deep as possible with remaining funds. Should loss of hole occur near completion, then as much data as possible should be collected for input to the program. All should not be lost, particularly if additional data is purchased.

B. Plan of Action

1. Sources

The source list will be generated by the SEP with input by DOE-HQ and others, along with advertisement in the CBD.

Consideration of compiling a source list will be the eligibility of proposers with access to drillable sites in the Cascades and the willingness to 50/50 cost share.

2. Competition

A source list will be developed and the solicitation will be announced in CBD. Multiple selection will be made for award.

3. Source-selection Procedures

A Source Evaluation Panel will be set up along with a Technical Advisory Committee. These two groups will aid in establishing technical requirements, evaluation factors, and proposal reviews.

The solicitation should be out to proposers by September to allow for a 6-8 week response period to include a pre-proposal conference. This is to provide for proposal review, selection and initiating negotiations in October, so contracts are in place as soon as possible at the beginning of FY 85.

4. Contracting Considerations

5. Authority for Contracting by Negotiation

NA

6. Budgeting and Funding

Budget estimates were established based on current industry costs for similar wells. The intent is to spend the maximum amount of available program funds on drilling in FY 85 with the emphasis on FY 86 funding for experiments.

The solicitation and procurement are scheduled to fund projects with FY 85 monies which are allocated in the FY 85 President's budget.

7. Product Descriptions

NA

8. Priorities Allocations & Allotments

NA

9. Contractor vs. Government Performance

NA

10. Management Information Requirements

Participants will be monitored by DOE-ID technical representatives on a frequent basis. This should include weekly or more frequent telecons during drilling and experiment stages.

Participants will be required to submit monthly cost and status reports.

11. Make or Buy
NA

12. Test and Evaluation

The participant shall be required to provide during drilling certain borehole logs. These will include caliper, temperature, resistivity, SP, and sonic or neutron density.

Other data requirements such as coring, water samples and well capacity tests are most likely to be required as technical requirements are developed by the SEP and TAC.

13. Logistics Considerations

Access to wells is required up to 12 months from completion of drilling. We would expect the participant to be responsible for proper well completion and access. DOE would, during the 12 month period, conduct stabilized heat flow measurements and other experiments DOE shall be responsible for.

The participant may also conduct additional experiments during the interval. As part of DOE's cost share, a requirement will be to abandon the well at the end of the 12 month period, in which case DOE will complete the CA and future responsibility for the hole become solely the participant's.

Data available prior to and gathered during the 12 month period by the participant is data DOE would wish to purchase and make publicly available. It is the intent that the gaining of such information be requested by the solicitation and offering of such data by a proposer will be used as part of the evaluation criteria for selection.

14. Gov't Furnished Property

NA

15. Gov't Furnished Information

NA

16. Environmental Considerations

DOE will request an Environmental Evaluation for each project (hole). The EE will require address the "what" or detached project description, the "how" and the "consequences" which will identify existing environment and how the participant expects to handle the impact to the environment. An approved EE will be one of the first deliverables under the CA.

17. Security Considerations

NA

18. Other Considerations

NA

19. Milestone for Procurement Cycle

Procurement plan approval
Establish SEP
Establish procurement schedule
Establish Technical Advisory Committee
Start SCP
Statement of Work
Specifications
Data requirements
Issue solicitation
Pre-proposal conference
Evaluate proposals and select
Beginning & complete negotiations
Contract preparation, review and clearance
Contract award

20. Identification of participants in Procurement Plan Preparation

Elizabeth Hyster, CMD
Susan Prestwich, ATD
Cliff Clark, OSD



DO F-1326.3 (Rev. 05-82)
Ref. 1225.1A

U.S. DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

TELECOPIER TRANSMITTAL REQUEST

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All Staples

Date 6/13/84

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To Mike Wright, Univ. of Utah, UPI

Org. Location Salt Lake City, Utah Telephone No. 208-581-5283
581-6151

From Susan Pretwisch

Org. Location DOE-10 Telephone No. 583-1147

This transmittal consists of 13 pages.
(excluding cover sheet)

Return original to Susan Pretwisch at Rm-119

07-1 03 81 210 11



United States Department of the Interior

GEOLOGICAL SURVEY

Water Resources Division
345 Middlefield Road
Menlo Park, CA 94025
June 4, 1984

Susan M. Prestwich
Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

SUBJECT: Cascades Solicitation for Proposals

Dear Ms. Prestwich:

It is gratifying to learn that DOE proposes to fund a drilling program in the Cascades. Such a program could do much to resolve some of the unanswered questions about the Cascades geothermal resource. In response to Clayton Nichols' letter of May 24 on this subject, I offer a few comments based on my own experience in this area.

First, I hope that the term "gradient drilling" does not completely describe the kind of effort that will be undertaken. In the past, "gradient drilling" has meant simply observing temperatures in drill holes. This limited approach has not produced much useful information in areas dominated by shallow hydrothermal convection systems. Temperature gradients measured thus far at shallow depths in the Cascades have been, in fact, misleading as indicators of the nature of underlying thermal regimes. Newberry Volcano is a good example of this phenomenon. Furthermore in typical gradient holes, little knowledge has been gained regarding the geochemistry and hydrology of the area, or even, in some cases, the lithology.

I would hope, therefore, that future drill holes could be programmed to return much greater dividends on the investment. The process should start with careful siting of the holes in the light of current knowledge of the geology and hydrochemistry. On the assumption that holes drilled only to several thousand feet are not likely to encounter very hot fluids, testing and sampling should attempt to gain the maximum possible knowledge of the lithology, rock-alteration products, and hydrology in the shallow rocks penetrated.

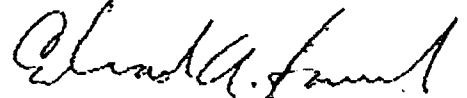
Information regarding vertical hydraulic and thermal conductivities would be especially useful in constraining a conceptual model of the hydrothermal regime, and hydrothermal-alteration studies of the kind that Terry Keith and others have done might tell us much about past and present hydrothermal conditions.

2

The above are a few very general comments. Much more could be considered, including relationships to surface and borehole geophysics, regional heat flow, and geochemistry. I hope that a broad spectrum of expertise can be brought in to this project in order to provide the best possible basis for decisions regarding the deep holes that will ultimately have to prove or disprove the Cascades geothermal hypothesis.

I would be happy to help in any way I can, including participation in on Advisory Committee. Please let me know if there is anything further that I could do. My phone in Menlo Park is PTS-467-2323.

Sincerely,



Edward A. Sammel
Hydrologist

cc: Frank Olsted
Patrick Muffler



3

Lawrence Berkeley Laboratory
University of California Berkeley, California 94720

(415) 486-4000 • FTS 451-4000

June 1, 1984

Ms. Susan M. Prestwich
Department of Energy
Idaho Operations Office
550 2nd Street
Idaho Falls, ID 83401

Dear Susan:

I am indeed interested and willing to serve on the Technical Advisory Committee for the DOE cooperative drilling effort in the Cascades. I do not have any involvements with prospective proposers that would prohibit my participation on such a Committee. However, my time is limited until late September.

I have a few comments or questions to make regarding the scope and technical parameters of the anticipated solicitation.

1. What geographic-geologic boundaries should be placed on the solicitation?

- e.g. a. The High Cascade Range only (implying a region along the crest of the Holocene volcanoes) or
- b. The Central Cascade (High and Middle) of southern Washington and Oregon, or
- c. The Cascade Region, which would include areas such as Newberry Caldera and the Medicine Lake Volcano.

I presently favor the latter (c) to encourage as many proposals as possible and to insure broader geographic coverage.

2. As to the preparation and evaluation of proposals, what guidelines and yardsticks will be used for selecting sites for drilling? I suggest that the proposers indicate the following:

- a. Technical data base for area
- o Data from nearby wells
 - o geologic and hydrologic data
 - o geophysical data sets and interpretations over proposed site.
- b. Drilling plans such as depth, diameter of hole and proposed method of drilling and completing well. Realistic drilling costs estimates should be indicated in the proposal.

In the solicitation DOE might be wise to include words to the effect that preference will be given to sites in geothermally prospective areas, where good thermal data are lacking, and where DOE stands to get the most information from a well.

3. Does DOE envision this to be a program of modest scientific objectives or should we attempt to find a way of maximizing the amount and quality of scientific information gained? E.g., the solicitation might ask for proposers to offer data to DOE or to suggest cost-shared data acquisition, such as:

- o Geophysical well logs
- o temperature-pressure profiles
- o drill stem tests
- o flow test data (if well flows)
- o fluid properties
 - major and minor element geochemistry
 - stable isotopes
 - dissolved and free gases
- o lithology, volcanic stratigraphy, hydrothermal alteration
- o detection and characterization of fractures from
 - lost circulation
 - temperature-pressure profiles
 - spinner surveys
 - well log analysis.

4. Interagency coordination is needed, particularly with the USGS. They probably have an interest and the funds to undertake part of data acquisition, analysis and synthesis under the banner of their Cascades program.

5. We hope there will be a scientific role for the National Labs and the State agencies (e.g. DCGAMI) such as we had under the Mt. Hood Resource program. If that is the case LBL would strongly consider proposing to DOE scientific activities we could undertake in support of the Cascade drilling.

Sincerely,

Norman E. Goldstein
Staff Sr. Scientist

NEG/lh

cc: Clay Nichols, DOE/IDO
Marty Malloy, DOE/SAN

RECEIVED

JUN 7 1984

ADVANCED TECHNOLOGY
SECTION



STATE OF OREGON

INTEROFFICE MEMO

TO: Cascade Drilling Group and
Interested Parties

DATE:

FROM: George Priest

SUBJECT: Central Cascade Scientific Drilling Program (CCSDP)

This is to confirm that the CCSDP group will convene on June 18, 1984 8:00 a.m. in the Building 6 Conference Room, USGS Headquarters, 345 Middlefield Road, Menlo Park, California.

I have received all sections of the scientific plan except one by Dick Couch. When the last section is received, I will distribute the package to contributing members of the group for review.

Because of the shortness of time, I will not be able to edit the scientific plan at this stage. The group as a whole will edit the document at the meeting in Menlo Park. I will bring a clean copy of the scientific plan with me to mark up the changes. Major changes requiring substantial rewriting of a section will, of course, be handled after the meeting by the appropriate authors. However, I will endeavor, if at all possible, to leave the meeting with a complete, edited report which I can put into final form at my office.

I would also like to remind you that at least rough cost estimates should be given for contemplated work. Whereas these costs will not be incorporated in the initial draft of the plan, I would like them for reference when talking to funding agencies.

Please bring 4"x6" cards with your bibliographic references on them or at least a list of references cited, if you have not already sent a list to me. This will greatly facilitate final preparation of the document.

On another issue, our agency will not be able to handle more than minimal drafting, owing to an overloaded publication schedule. It would be most helpful if each contributor could provide camera-ready copies of illustrations.

#

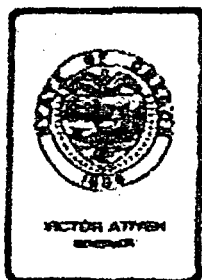
GP:bj

cc: Don Hull
Clayton Nichols
Susan Prestwitch
Dan Weill
George Kolstad - *cc*
Ian MacGregor - *cc*
Jack Hermance - *cc*
Pat Muffler
Robert Andrews - *NAS*

RECEIVED

JUN 11 1984

ADVANCED TECHNOLOGY
SECTION



Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE

1005 STATE OFFICE BLDG., PORTLAND, OREGON 97201 PHONE (503) 229-5580

June 5, 1984

Susan Prestwitch
U.S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

Dear Susan:

Regarding Clay Nichols' letter of May 24, 1984, I would be happy to participate on the Technical Advisory Committee for the Cascades thermal gradient drilling program. There are, however, some constraints on the participation of our agency which should be mentioned. We want no direct responsibilities for administering the drilling funds. We will advise on the scientific merit of proposals but will not compete for any of the funds targeted for drilling.

Our participation will be primarily aimed at assuring that maximum research-quality data be collected. However, I would like our agency to play a role in collection of data, if possible.

Thank you for this opportunity to participate in what will be a very important step in our efforts to understand the geology and geothermal potential of the Cascades.

Sincerely,

George R. Priest
Geothermal Specialist

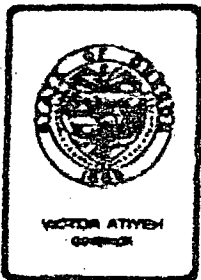
GRP:bj

cc: Don Hull
Clay Nichols

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JUN 8 1984

ADVANCED TECHNOLOGY
BRANCH



*Called G. Davidson
w/Print 5/7/84
C. 100*

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE

1005 STATE OFFICE BLDG., PORTLAND, OREGON 97201 PHONE (503) 229-5580

April 27, 1984

RECEIVED

1984

Dr. Clayton R. Nichols
Deputy Assistant Manager
Energy Technology and Conservation
U.S. Department of Energy
550 Second Street
Idaho Falls, Idaho 83401

Dear Clay:

Don Hull recently returned from Washington D.C. where he met with a number of officials, including Ron Toms. Upon his return, Don briefed me about a USDOE budget request to Congress which was described earlier by Jebbe Davidson. This request reportedly includes \$1,400,000 for resource characterization in the Cascades with "...at least \$1,000,000 available for a cost-shared series of deep heat-flow holes in the Cascades..." (quoted from a March 26, 1984 letter from Robert L. San Martin to Jebbe Davidson; copy enclosed). According to Don, these holes are to be 2,000 - 4,000 ft. in depth and sited along the entire length of the Cascades.

As you know, on November 7, 1983 I proposed a similar program of 1,000 m temperature gradient drilling in the Oregon High Cascades (see enclosed letter to Ron Toms). The letter also proposed a program of 152 m wells in the south part of the Western Cascades to complete the regional map of the heat flow transition zone. Wells in all cases were to be sited on the basis of extensive surface surveys.

My concern with the current USDOE approach to drilling in the Cascades is that the wells may not be sited or drilled so that maximum geologic information will be obtained. Adequate surface surveys and impartial scientific analysis should be the basis for siting the wells. I propose that any cost-share proposals for drilling in the Cascades be subjected to intense scientific scrutiny to determine if the holes are adequately sited.

In order to site the wells in Cascade areas with the best potential and the greatest need for data, I would like to see a preliminary step which would allow an advisory committee of Cascade scientists and industry representatives to establish where the highest priority regions are. This would have the advantage of focusing the money on the most important areas. Discussions by this type of committee would also encourage a sharing of existing data between industry and government.

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Dr. Clayton R. Nichols
Page 2
April 27, 1984

Once a project is approved, arrangements should be made so that the maximum amount of data can be gathered from each well. Those who argue that this adds unnecessary cost need only look at the earlier Old Maid Flat project at Mt. Hood. The costs of scientific analysis accounted for only about 5% of the total budget and yielded the only lasting product from the wells (see DOGAMI Special Paper 14, enclosed). What is more important, we have, because of the scientific analysis, some ideas about why the wells were not successful. If we do not learn anything, what is the point of spending the money?

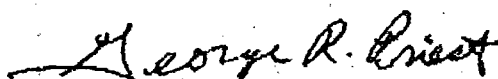
In order to implement my suggestions, I propose that the group of Cascade experts that has already been assembled for the continental scientific drilling program be used to review proposals and do the scientific work on these wells. A preliminary committee composed of both this scientific group and industry workers should meet as soon as possible to establish priority targets for the holes.

On a separate issue, I would like to see about \$200,000 of the money set aside to complete mapping of the western edge of the High Cascade heat flow anomaly. This requires about twenty 152 m holes drilled in the easternmost part of the Western Cascade Range. This could complete the regional heat flow map for the southern 40% of the heat flow transition zone in Oregon.

It would be useful for us to meet and discuss these and other ideas before this new drilling program becomes operative. I think we have an opportunity to learn from earlier mistakes and maximize the effectiveness of the program.

Please let me know when and where you would like to meet. Don and I would be willing to fly to Idaho Falls, although you are more than welcome to come visit us, if that would be better for you.

Sincerely,



George R. Priest
Geothermal Specialist

Encl.
cc: Don Hull
John Hook
C.G. Davidson



9

Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

June 12, 1984

Ms. Susan M. Prestwich
Dr. Clayton R. Nichols
Energy Technology and Conservation
US Department of Energy
550 2nd Street
Idaho Falls, ID 83401

Subject: Cascades Solicitation Strategy and Criteria

Dear Susan and Clay,

In response to your letter of May 24, I am indeed interested in participating in ID's Technical Advisory Committee for cooperative thermal gradient drilling in the Cascades region.

My comments and suggestions are concerned with the overall strategy for DOE's geothermal activities in the Cascades in relation to this specific solicitation. In this respect, I have benefitted from USSS/Pat Muffler's, Union/Dick Dondanville's, and LBL/Nora Goldstein's ideas.

Cascades Geothermal Enigmas

Despite the horrendous explosion of Mt. St. Helens on May 18, 1981, and the ample evidence of recent volcanic activity, the Cascades remain a geothermal enigma. There may be extremely large geothermal energy resources beneath the Cascades Range. Such a large energy source will have major economic implications for the Pacific Northwest states and Northern California.

Where are the volcanic hot spots? Are geothermal reservoirs associated with them? Is it possible to locate geothermal drillsites, and to demonstrate practical means of producing useful energy from such reservoirs? Is it possible to get the heat out safely, and with environmentally acceptable processes? And, most importantly, can potential geothermal reservoirs be brought to the point of commercial application, for the generation of electricity and direct heat uses? At this point in time, we apparently don't know the answers to these practical questions.

Background and Rationale

Extended research has been conducted by US Geological Survey (USGS), Oregon's Division of Mines and Mineral Industries (DOGAMI), and others. Yet, we have only a limited understanding of the chain of giant stratovolcanoes which stretch from Lassen Peak and Mt. Shasta in Northern California, through Oregon's 9 major volcanoes, past Washington's 5 major

peaks including Mt. St. Helens, and north into Canada. Despite some continuing exploration efforts, several major geothermal development companies, like Sun and Phillips, have apparently given up.

Therefore, it appears that Federal financial assistance is necessary to encourage the extensive exploration, research and development required to define the commercial geothermal potential of the Cascades. Cooperation of the private and public sectors is needed to solve the scientific and technological problems involved.

For such a multi-institutional effort to successfully reach its goal, DOE needs a comprehensive strategy for Cascades Geothermal R&D.

The DOE strategy must be linked with efforts of the USGS, which has the legislative authority to "conduct regional surveys...which will lead to a national inventory of geothermal resources..." (Public Law 93-410). It must effectively cooperate with major public experts in the region, like DOGAMI; California's Division of Mines and Geology, and Division of Oil and Gas; and Washington State's Department of Natural Resources. Private industry must be the driving force in commercial development and steam sales. Public utilities are potential purchasers of geothermal steam, and the Bonneville Power Administration has the Federal mandate for power marketing in the Pacific Northwest, including Idaho and Montana. The US Forest Service, the US Bureau of Land Management, and State forest services are responsible for leasing and permitting of geothermal activities in the extensive forests that cover the Cascades. Environmental agencies and groups, ranging from EPA to the Sierra Club, are properly concerned, since the Cascades are a major scenic and wildlife area of the nation.

With such institutional complexity, no wonder earlier efforts have foundered!

Proposed DOE Cascades Geothermal Strategy

The proposed DOE strategy is aimed at characterizing the geothermal energy potential of the Cascades. This means: location and exploration of specific geothermal reservoirs, if they exist; definition of reservoir energy capacity and longevity; and, technology development for the purpose of resolving all major problems inhibiting the fullest possible commercial utilization of Cascades geothermal resources, in a safe and environmentally acceptable manner.

The proposed steps in the DOE Cascades Geothermal Strategy are those in the classical sequence of locating and evaluating a subsurface natural resource:

1. Regional geological, geophysical, geochemical and hydrological surveys, resulting in an integrated conceptual geologic model of the High Cascades and nearby geothermal areas, such as Newberry Caldera, OR.
2. Identification of potential geothermal prospects, and preparation of definitive three-dimensional models for the targeting of intermediate

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depth (1,000-3,000') drillholes at each prospect.

3. Identification of gaps in knowledge which prevent the completion of the drill targeting, step 2. above, and the acquisition of essential geophysical surveys, geochemical sampling, shallow heat flow and temperature test holes, etc., for the targeting of deep slim holes (3,000-6,000') at high priority prospects.
4. Updating and revision of established conceptual geologic models and prospect priorities as a result of information from shallow, intermediate depth, and deep slim holes.
5. Targeting of a few deep (~10,000') drillholes at high priority site(s) of potential high temperature geothermal reservoir(s).

USGS/Muffler Cascades Drilling Strategy

USGS/Pat Muffler informally summarized the objectives of a Cascades drilling program as:

- a significant number of stratigraphic test wells;
- which yield an evaluation of the Cascades geothermal resource, despite the hydrologic problems, (the 'rain curtain' which has masked subsurface temperatures on prior 2,000' holes); and,
- which result in significant drillhole data in the public domain.

Pat's strategy is a subset of, and consistent with, steps 1, 2, 3, and 4, above. He emphasizes obtaining geologic (stratigraphic) and other data, despite the serious 'rain curtain' problem which may wipe out meaningful temperature results.

USGS/Bob Mariner's geothermometry apparently indicates that the hot springs, out on the flanks of the Cascades, may have a "cold" source. The hot springs may only indicate low-temperature leakage, along valley faults far from the heat source. Much of the leasing activity appears to be around these hot springs, in the lowlands between the peaks. If so, drilling the hot spring leases may be a waste of time and money.

Union Geothermal's Cascades Drilling Strategy

Union/Dick Dondarville does not support a number of intermediate depth temperature holes, but rather proposes a single deep well. This sounds like step 5, above, and apparently presumes Union's existing knowledge from regional geophysical surveys, geochemical sampling, and temperature holes, (in other words, steps 1 - 4). In speaking with Dick on March 29th, he said that he doesn't know the magic depth required to get below the 'rain curtain', but 1,000' is not enough. He questions the drilling of a number of temperature holes, and wonders how much slim hole you'll get for \$300K, (in view of the many drilling problems).

Dick called the Cascades "a real enigma"! We have yet to determine whether there is a significant high heat flow anomaly in the region. He feels that

eventually, some group will have to drill a 3 km. hole to find out if the Cascades have a high heat flow, or not. Dick makes two arguments. First, a deep hole drilled almost anywhere in the Imperial Valley would detect anomalously high heat flow. If the Cascades contain Beyers-sized geothermal reservoir(s), a deep hole should (get below the 'rain curtain' and) detect anomalously high regional heat flow. Second, he suspects that "all that water pouring out and washing the heat flow away" is just an excuse. Dick observes that it rains as much or more in Java and Sumatra, but flying over those areas you can see the outline of the geothermal systems in the arc of hot springs of the volcanic system.

If Dick could convince Union's management, he'd drill a deep hole. A representative location could be picked by a group of august scientists from a scientific and tectonic point of view; they should not look at a lease map. The purpose is exactly that of DOE's Continental Scientific Drilling Program (for which he is an advisor): to define the roots of the Cascades and the thermal boundary of the plates. In other words, deep volcanic structure and stratigraphy of the High Cascades. If the deep hole finds high temperatures, (in addition to measuring regional heat flow), that would be a bonus.

Dick suspects that the active Cascades volcanoes may have a narrow conduit, without a shallow magma chamber. He feels that a 4,000' hole is not going to discover a geothermal reservoir, but is a step in the right direction. He suggests core drilling to get rid of the lost circulation problems, (the powder packs away in the fractures). Dick isn't particularly receptive to joining a 3,000-4,000' drillhole effort. Union wouldn't get enough out of the effort to be worthwhile; they might as well use the money themselves to drill, and keep the results proprietary.

Conclusions with Respect to ID Solicitation

Union's Cascades strategy underlines our major difference with the non-strategy proposed by Davidson - a number of temperature holes until your money runs out. Geothermal exploration should successively reduce drilling risk and project cost through increasing steps in knowledge. This objective is normally accomplished by beginning with regional surveys, and progressively narrowing down prospective areas to a few prospects - for which conceptual drill targeting models are defined.

DOE needs to know if there is enough evidence, such as geology and geophysics, on the geothermal potential at the proposed site(s).

Following the proposed DOE strategy, above, we need to take these actions:

- A. Before reviewing proposals, work with USGS, DQAMI and URI to assemble regional and site data into maps outlining favorable areas, with supporting geophysical, geochemical, and hydrologic data (step 1). Within these favorable areas, outline specific prospects, each with a drill targeting model consisting of cross sections and justification for nature, depth, and temperature of the drilling target (steps 1 & 2).

- B. Require the proposers to present the evidence and justification for proposed sites, in terms of conceptual model, geology, geophysics, geochemistry, hydrology, cross sections, existing drill data, logs, etc.
- C. Establish qualification criteria for accepting drilling proposals for evaluation, consisting of the evidence and justification in B, above. Simply offering their "best lease" is a good basis for disqualifying their proposal.
- D. Establish rigorous qualification and selection of driller(s), based on experience in high mountain drilling in hard, fractured volcanic rock; with strict inspection and quality control of equipment, esp. drill pipe.
- E. In the manner of the ID's Industry-Coupled and State-Coupled Programs, establish rigorous procedures for documenting the cost-shared drill-holes, collecting drill data, and analyzing it in cooperation with experts on those areas. Proprietary rights to data for 6 mos. to 1 yr. may be negotiated with participants, to encourage submittal of the best, rather than marginal prospects.
- F. Identify gaps in knowledge of prospects, priorities, targets and technologies, to be addressed by DOE (EUBBS) R&D tasks in FY'86-on.

Suggested Drilling Prospect/Target Criteria

- a. Prospective area includes the Cascade Region (Goldstein l.c., letter of June 1 to you.), from Lassen Peak, CA north to the Canadian Border, including Medicine Lake/Blaine Mtn., CA and Newberry Caldera, OR (see attached map, gray area).
- b. Biologic evidence of recent (<200,000 yr. old) volcanism, or current volcanic activity associated with prospect site.
- c. Proposer specifies the drilling target, at depth, and attempts to associate it with a magma chamber and/or geothermal reservoir.
- d. Proposer attempts to locate prospective steam/hot water user within economic distance of the site.
- e. Priority given to high-temperature, electric power generation prospects.

Sorry to run on so long. Trying to get the horse back in front of the cart requires an overall perspective of Cascades geothermal exploration, before narrowing down to the temperature drill holes.

Sincerely,

