GL000806

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MEMORANDUM

January 7, 1981

TO: Max Dolenc

FROM: Jon Zeisloft

SUBJECT: UCCDP Pre-Negotiation Review--Proposal #002 (Magic Hot Springs Landing, ID.)

The following is a summarization of comments made by the proposal review team from ESL, and should serve to refine the proposal for the negotiation process. In addition to the following comments, all general provisions for proposals as listed in 12-19-80 memo, J. Zeisloft to M. Dolenc, must be included.

Resource--We feel that the proposer is overly optimistic in their anticipated flow and temperature. We believe it is unlikely to encounter 300°F fluids at the target depth of 3000' and that it is equally unlikely to produce 675 g.p.m. fluid from a fracture reservoir from one well. It is essential that the proposer consider an alternative, smaller ethanol plant or the necessity of drilling more than one production well. These factors, of course, reflect on the cost share plan as it will be negotiated.

The proposers further state that 50 g.p.m. of 80°F water will be usable for cascading. As it stands, DOE could pay for an ethanol project failure and the proposers could proceed with a profitable development of the cascaded processes alone. Therefore, DOE should negotiate the project to "GO" if fluids are produced which will only provide for the non-ethanol, cascaded portions of the planned operation.

Exploration--The shortcomings of the proposal in this area are reasonably well summarized in the Proposal Evaluation Summary (PES) along with suggestions for improvement. The following applies also. Most of the lineaments and structures appear to be defined from aerial photos without ground checking. Many of the lineaments appear to be nothing more than vegetation differences on alluvium overlying subcropping layers of basalt.

In addition to PES suggestions, production, chemistry and thermal data of all local wells should be integrated with geological, geophysical and geochemical data to be collected and interpreted as part of this study.

In that limited outcrops of the Idaho batholith occur less than two miles east of the project site (at which location batholith rocks are overlain by Tertiary volcanic rocks) it can be speculated that Cretaceous granite of the batholith may be present at a relatively shallow depth beneath Magic Hot Springs. The proposer should consider what production flow rate could be expected from a hole into fractured granitic rock versus fractured volcanic rocks as seen at the surface. With this aspect in mind, an object of geophysical surveys should be to establish the presence and depth to granitic rocks. It is recommended that the dipole-dipole geophysical technique be used to detect thermal fluids instead of the EM method proposed.

The review team recommends 5-6 500'-600' temperature gradient holes rather than the 3 1000' holes the proposal calls for. We feel the shallower depth is adequate, and more holes than three are needed. The siting of the gradient holes will be determined upon review of all geological and geophysical data, and should cover a greater area than the limited MRI acreage. Additional structural data should be obtained by preparing very detailed, accurate lithologic logs of the gradient holes. A minerals industry logging company should be used to obtain a gamma ray-SP-dual induction log of each gradient hole.

The proposer should specify the area in which they intend to do detailed geologic mapping and not leave it a vague "several miles."

DOE should consider requiring a decision point and data review for the gradient hole siting, as well as for the siting of the proposed production hole.

Drilling--We feel the 4½" casing proposed for the gradient holes is clearly excessive. DOE should restrict that budget item to 1" or 2" black iron pipe as has been found completely adequate in ESL and related studies in Idaho and Utah; The conductor pipe can be proportionately smaller.

Shallow aquifers and fracture zones must be tested as encountered in the production well to evaluate shallower resources and to provide data for possible later fluid injection needs.

In an area dominated by hard volcanic rocks (and maybe granite) straight rotary drilling is not likely to work as well as down-hole hammer drilling. The proposer should consider, as part of his drilling program, the use of a Mission or similar hammer tool. Evaluation of various tools and techniques could be accomplished during the drilling of the gradient holes.

A full suite of geophysical logs must be required in the production hole, not just the proposed IES and GRN logs.

Production casing must have centralizers approximately every 500' from TD to the surface to assure a good cement bond. In addition the overlap of different strings of casing must be $\geq$ 200'. After emplacement of 9 5/8" casing at 1000', we recommend that the proposer drill 8 3/4" hole to TD (±3000').

Then, following logging and any preliminary testing, production liner should be hung from 800' to just short of TD, and cemented from above the production zone to 800', with perforations below the cemented interval.

The proposer needs to state how H_2S will be monitored and controlled during the drilling of the production well.

Testing--A more detailed testing program than that presented in the proposal must be provided to DOE's satisfaction prior to signing of the contract.

Cost Share--To begin with the proposal is inconsistent as to defining a successful well. The 280°F minimum fluid temperature seems unrealistically high for the process, and we feel that EG&G engineers should substantiate the fluid requirements for the proposed size ethanol plant, as it weighs on the cost share scheme.

Secondly, and most importantly, if the geothermal fluid is cascaded after its use for ethanol production the cost share plan is unfair to DOE and that plan needs to be adjusted accordingly.

It seems the cost share plan as presented reflects on what the MRI hopes to find and not on anything close to what is known to exist.

Institutional--At the pre-production well decision point MRI must show proof of ownership or lease rights to the appropriate land as well as rights to the water to be produced. All necessary permits (of access, rights to cold water for process use, evaporation ponds, etc.) must be to DOE's satisfaction prior to the signing of a contract. Is Lawson's letter (p. 140-Tech. volume) sufficient proof of geothermal resource ownership definition at this site?

Environmental--Can MRI dispose of their spent process fluids into Magic Reservoir? Can they show any evaluation of the affects? Is this acceptable to DOE? If not, will DOE require MRI guarantee funding on injection well? Are there any other waste products of their process(s) which could cause a delay (or termination) of the project due to environmental concerns?

Business--Predicted expenses are too high in many categories and should be closely scrutinized by DOE business advisors. Some of the more obvious excess are discussed here. DOE should require that project field and drilling work be done from a much closer town than the proposed Twin Falls to reduce rental car costs and to allow more manhours/day on actual project work. The amount of $2000 for a drill site outhouse is very much out of line.

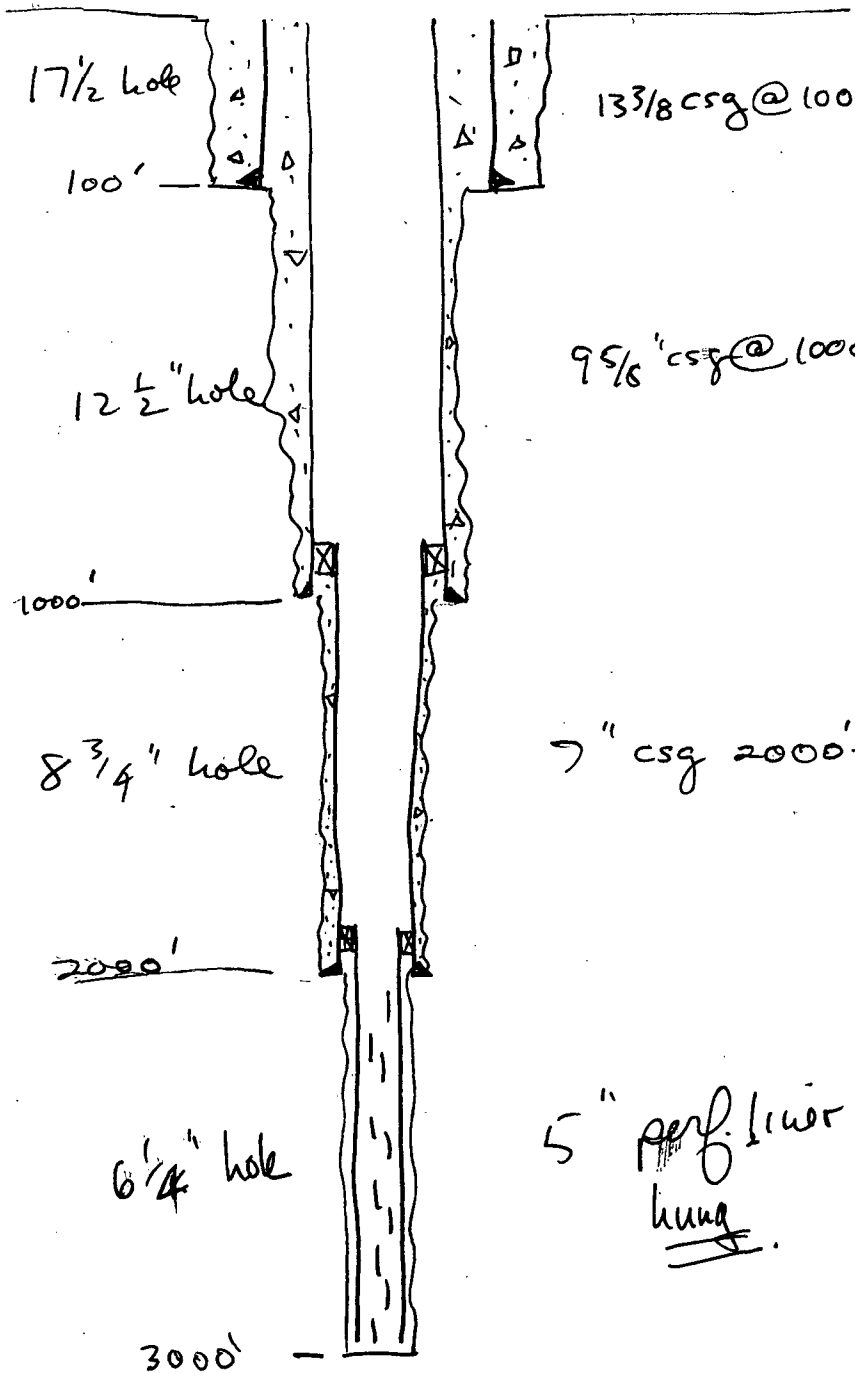
Proposer must clarify and substantiate pg. 134 (Tech. volume) to the DOE negotiator's satisfaction, as the alternate energy source, as it relates to the cost share scheme. DOE should check out all rates shown on form 60, as they appear excessive.

Finally, we recommend that DOE require that the project be cost accounted to their satisfaction and that DOE NOT accept a "cost plus" contract.

JZ:jr

ANACONDA

Memo From
JON ZEISLOFT



MAGIC RESOURCES PROPOSAL - UCCDP review (ESL Team)

Resources. -
inconsistent flow + temp

expl | 1. Geoplug
expl | more, shallower grad holes.
expl | Grad holes after geol + geoplugs.
expl | after well's w/r chem.
decis. pt | decision pts too soon after drlg
" | Too many things sched'd concurrently.

BUS | BUS.- Cost (&) contract no good. COST PLUS
to this already for maybe needing inj well?
BUS. | Justify 4½" csg in grad holes.
GX.PL | Gravity + mag to determine depth to batholith.
USG | DOE 80°F @ 5 spm usable for cascading
should negotiate for project to "GO", if just
cascade projects to be built.
BUS | Pay twice a month should be mixed.

EXPL | Rec'd | 5-6 500-600' grad holes
number to be dependent on geol + geoph data
BLD WTR. | where will process water come from.
must commit to ethanol - plan(?) to fail on ethanol
needs, & then on large pmt, go ahead w/ cascade
uses.

PERSONNEL must have dev. led lithlog to aid. - struct detection -
★ better than mud logger would do.

TSTG. | Tstg plan letter - .
| conflict of interest w/ GRUY Fed !?

EXPL. REC. | Do not do EM —
| DO dipole-dipole

DRLG. ✓ Rec - minerals rig for prod'n hole.

Key Decision pt - where to drill, not if to drill.
Land posit to be verified prior to.

EXPL | Geophy + grad holes to be over larger land area than MRI

Business -

BUS Costs excessive
sign painter
privvy
cost share trip to Hurley, ID. ? Hailey — Typo ---??

Must clarify #2 fuel oil cost relationship to cost share
(p.134 ¶ para 2)
Btu to Btu or gal to gal.
price / gal
who is supplying fuel oil?
what historical justifin for the oil costs?

* entire para 2+3 (p.134) needs to refried & clarified to DOE satisfaction.

DOE's ofland people should consider the plant in detail

* DOE to ck @ all rates on form 60 — too high ??

Project should be cost accounted to DOE's satisfaction.
No "cost plus", fixed fee contract !!

We would like to see contract's prior to signing !!

45
116

Magic Hot Springs (BRUCE)

Questions:
1. what kind of flow rate can be expected from the Idaho Batholith?
2. Is there a typical formation the overlays the batholith in this area? EXPL
3. Would Dipole-dipole resistivity be useful? It would pick up conductive thermal fluids.
4. Is 4½" casing to the bottom of the 1000' holes needed? DELG

Exploration:

A. Once the ESL report by Zeisloft & Jewel is included the literature review will be complete enough except for hydrologic data such as: EXPL
   1. Area irregation wells produce what gpm from what depth & Formation.
   2. What production rates have be achieved from the Idaho Batholith rocks.

B. 1 The mapping done by ESL could be extended.
   2. The thermal gradient hole program should be expanded to more holes even if it means drilling 6 holes to only 600' to stay within cost limitations. EXPL.
   3. Accurate lithology logs of the holes should be prepared to improve the structural interpretation.

Edwin

002 - Magic Hot Springs Idaho

The necessary comments regarding the resource evaluation and exploration are pretty well summarized in the Proposal Evaluation Summary. If this proposal represents the present understanding of the system by MRI and the competence of the geologic teams, we have reason to question both. Specifically -

EXPL (1) all of the lineaments and structures seem to have been defined from air photos only without ground checks. - on page 24, the "lineaments" of the "shear zone", when looked at on photos are probably not. The seem to be due to vegetation differences on alluvium overlying ~~outcrops~~ subcropping layers of basalt.

(2) the significance of recent rhyolite domes is not emphasized.

EXPL The depths of gradient holes are not specified. This should be determined by checking on the depths of local groundwater aquifers. The T.G. holes should be drilled well into the bedrock below these shallow blanketing aquifers.

42
130
1260
42
5460 gal/day

JZ

Magic Resource Investors (002) -

2×10^6 gal/yr ≅ 47620 bbl/yr ≅ 130.5 bbl/day.

Magic H.S. well ~66 gpm @ 165°F at surf (geotherm's ⇒ 239°-300°F)

Min requirement 600 gpm @ 280°F

present well 136 gpm @ 163°F (241' deep)

USE ★★ Basic Question - alternate plan for ≤ 600 gpm?

Costs, AV - $.83/gal for feedstock

Alcohol sales $1.70-2.00/gal.

+ galed annual fee

EXPL X Expl -

Need more than 3 grad. holes -

" X Need more details of Geophysics to be used, present geoph. program has one decision pt, or pre-contract).

" / DRLG ~~Geophys. & Drlg consultants to be specified~~

DECIS. PTS. Decision pts between each phase of expl + prior to each bout of drlg.

TSTG/DRLG Test prod'n well w/ided drlg, to:
1. evaluate shallower resources
2. to provide data for possible injection needs.

MGT -

MGT MRI not adequate for mgt - DOE should require mgt duties to be by expl'n oriented consultant

Propose to develop logging program w/ DOE help.

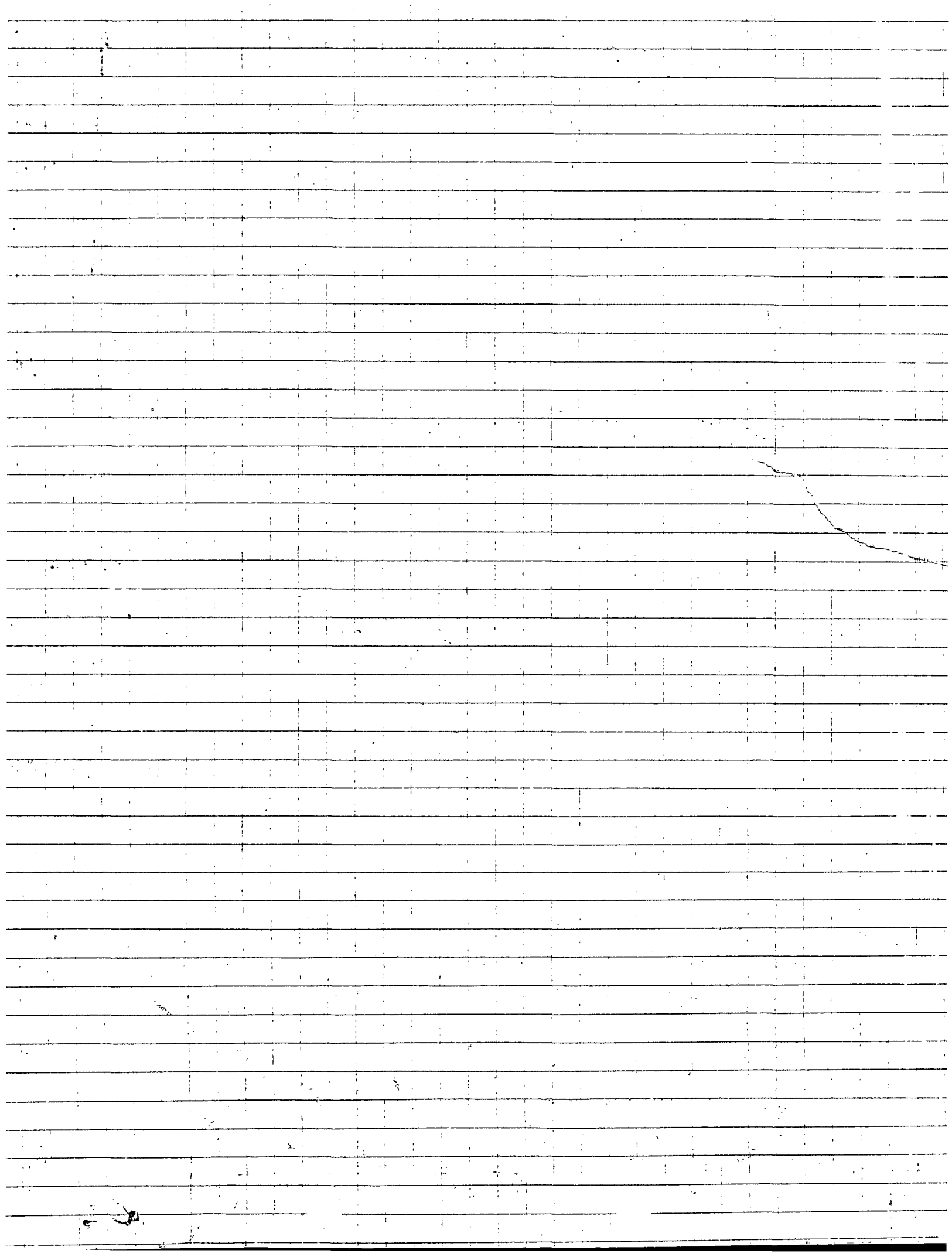
~~Propose to log test holes~~

DRLG. Drlg personnel sound v. good.

EXPL p. 120 Drlg grad holes, requires 6" hole in 2 days

CSG p. 120 Use centralizer also at 500' intervals on prod'n CSG

" 123 #12 - CSG overlap must be ≥ 200' - Drill 8 3/4 to 3000



2/

CSG Do not need 7" CSG

CSG 8 3/4" hole from < 1000' csg allows going down to 7 7/8 if need be, in which 6" CSG could be run.

DRLG In volcanic rocks of area, straight rotary drlg not likely to work - should consider downhole hammer tool, zB "Mission" tool. ☆

TSTG Tstg - just OK - could give more detail

COST SHARE Cost Share seems excessive, but well explained pp 132-134.

INST. Inst - All necessary permits prior to signing contract.

" p140 also proof of GT & wtr rights - is Lawson's letter enough?

ENVIR Envir. How will H_2S be controlled, if necessary? p142

BUS. Business

p16 TASK III Travel - DOE should require they work out of a town much closer than Twin Falls to reduce car costs & provide more man hrs / day on project.

$2000 for drill site privy is excessive.

~~p17 " Subcontracts - w/ Failing 1500 rig (or equivalent)~~

p17 " " should consider

p20 ? Task IV Cost of 7" csg could be omitted.

DRLG p21 " must require full suite of logs, not just IES & GRN

TED

Magic Hot Springs — p 1,209,328 — 2000000 gpm ethanol plant

ill min. of 675 gpm @ 280°F — see also p. 26.

p. 132 — summary sheet says 675 gpm ≥300°F

surface potential 66 gpm 165°F water.; 136 gpm @163°F well 260'

1,800 - 2500 meters to 150°C to 200°C resource (Mitchell)

LAND
1. land status — 4000' p. 28

RESOURCE
2. 3000' drilling target too shallow for 300°F?

"
3. rights to resource?

"
4. water rights for 2000 000 gpm ethanol production?. 600 gpm feed water?

EXPL.
5. gravity and/or magnetic surveys not needed? - get regional state data.

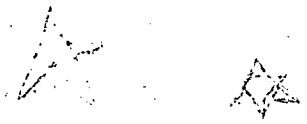
BUSINESS (DOE to coordinate this)
6. reimburse twice a month - a problem?

COST SHARE
7. If cascaded or other use of water is intended, cost share plan is unfair to DOE. If only Ethanol production is planned, cost share plan may be ok.

EXPL.
8. do "Artesian City study" - {geochemistry, etc local well surveys.

Ted Lenz
12/29/80

EXPL.
9. several shallow gradient holes - 200'-600' - AFTER doing geology & geophysics.



29 Dec. 80

D. Foley

Magic — 600' therm. grad. wells — 2 mil gal/yr = 45k bbls ≈ 2% of daily oil consumption (1/1000 US oil cons.)

BUSI (Business)

- $2k to Lonny on the spot (Business p20) — $7k to determine cost share in Hurley, Id
- $.08/xerox copy
- p28 $250 to sign painter
- p35 sale of geothermal energy - kwh @ discount of 25-50% on #2 fuel oil (how will this be figured? - fuel oil may not be a realistic option - what about geothermal sales price compared w/ nat. gas.
- p55 how is IDWR going to do their environ. work

Technical

COST SHARE
- Table 14 (p133) & pg iii do not agree on what constitutes a successful well
- p1 - geoth. resource "known to exist" - their cost share doesn't reflect the known resource, it reflects what they hope to find

INCONSISTENT
- 9 - what is flow - reported @ 250 gpm (table 3) & 250 l/m (pg 9) (66 gpm)

- 12 - heat source of buried stack on still (too cold too quickly?) - citing Mitchell

EXPL.
- 16 - if the area is highly faulted, why aren't any shown on the geol. map
- 25 - investig. diagenesis as part of geol. program (esp. if T > 200°F is sought)
- 26 - too optom. on utiliz. factor — what, after all, is a non-seasonal source of feedstock?
- 28 - state 3-4k' well

DISPOSAL
- 29 - surface disposal may not work

USE *
- 30 - unclear on who is paying whom for geothermal fluids

ENVIR.
- 37 - during anticipated down time, cheese whey dumped in desert - no go, since could store for 5 days
- 41 - is it true that only H_2O & CO_2 are produced?
  - odors from aeration pond -

INST.
- 42 - rezoning problems !

* SCHED.
- 71 decision points 1 & 2 are the same time (?)
  - decision 3, is 1 wk after completion of production well (not enuf. time to come to thermal equilib. ?)

29 Dec 80
D. Foley
p2

Magic., p.2

71 cont. thermal gradient sites begin drilling 6 weeks after start of exploration program

INST. all permits, incl. rezoning, are listed as do-able in 4 wks - may be unrealistic if there is a history of objections in the area

i.e. - flow chart needs to be reworked

116- exploration plan

EXPL. area of detailed field work is vague ("several miles") needs more work

mapping goals ok, but need to be made appropriate for target concept - (see prepared notes)

target concept vague, i.e. source of heat, recharge/flow paths not clear

at least they are worried about magnetic cleanliness of operator

- why 3 holes
- why 125°F cut off, why 1000' cut off (cost, rig capability, or geological?)

RESOURCE DEF'N 122 is 280°F bottom hole, well @ surface, or water @ 1st utilization plant temp.?

131 - why, if > 195°F, not just keep under press., rather than flashing & separating? - this may be my naivety, (sp?) since it may just apply to well testing, & not the production configuration

COST SHARE 133 cost share counts only on ethanol plant - program schematic on p27 includes optional lower quality uses - down to 85°F & lower -

shouldn't these uses be included in cost share, since the well will not be a total economic failure (?) [i.e. they could meet some requirements by using the sprung]

complete failure for 10°F decrease is unrealistic - is 280°F really the minimum for the process?

LAND 135 land status should be clarified

DELG. 142 H_2S control, etc., as noted on summary sheets, needs more control

PROPOSAL EVALUATION SUMMARY NO. 002

Technical score - 188

Business score - 25

Magic Resource Investors (Profit)
Magic Hot Springs Landing User-Coupled Confirmation Drilling Project
Magic Hot Springs Landing, Blaine County, Idaho

Jack T. Duree	$1,088,395	DOE Cost
January 14, 1981 (14 months)	1,209,328	Total Cost

Production Well

Percent Geothermal: 100%	$/10^6 Btu: $1.90
Utilization Factor: 40%	Btu/yr/DOE Funds 1.8x 10^5 $/Installed kW: $181.00
Reject Temp.: 205°F	Annual Equiv. #2 Oil: 1.99 x 10^6 gal

Summary

This project is to provide heat requirements for an ethanol production plant. The project includes geologic surveys, unspecified geophysical surveys, analysis of pertinent data, and the drilling of three 1000-ft thermal gradient holes, and a 3,000-ft geothermal production well. An injection well is not included in the present cost-share plan; however, if one is deemed necessary, the cost-share plan will need to be adjusted. A successful project is defined as having a flow rate of greater than 675 gpm at ≥300°F. Production is anticipated to be from fractured rock. The project team, managed by Magic Resource Investors, includes Charles Corwin (environment and institution) and Gruy Federal, Inc. (all other project tasks).

Technical Strengths

Resource. There are surface manifestations of resource temperatures of at least 165°F, but a significantly reduced chance of a 300°F resource. There is a significant chance of a 230°F resource. The resource is expected to produce reasonable flows, but two wells will probably be needed to produce the required flow of 675 gpm.

Drilling. The preliminary drilling plan is thorough and quite adequate with respect to casing, cementing, fluid handling, support services, and wellhead hardware. It is detailed and technically correct, and feasible from a drilling standpoint except for the use of mud to control artesian flow. The plan to

gather temperature information and to record such hard drilling data as bit weight, etc., is good. The plan to case the well to 2000 ft should insure the integrity of the upper aquifers.

End-Use. The technical designs and economics of the end-use appear very good if resource expectations are satisfied for the process. The process conversion will involve demonstrated off-the-shelf process equipment.

Technical Weaknesses

Resource. The resource temperature at 3000 ft. is likely to fall short of proposed end-use requirements. Fluid flow rates from the fracture system will be somewhat limited, calling for either scaling down the size of the ethanol plant or drilling two wells. The planned use of the shallow warm water well may not be feasible, due to possible interference effects.

Exploration. The surface manifestations are promising for a structural reservoir at depth; success depends upon the development of a realistic reservoir model and drilling from a carefully selected drill site. The exploration is not now designed for the delineation of the critical structures. The program should contain the following elements:

A. A thorough review of available geoscience literature for the area.

B. Geology (designed to determine near-surface location of structures)

1. The scale of mapping is not specified, but should be at least as detailed as 1:24,000, with emphasis on geothermal features and structure.

2. Thermal gradient wells should be logged for lithology and alteration. Analysis of the hydrology should be performed for these wells.

C. Geochemistry

1. A soil Hg survey can locate leakage zones along structures.

2. All springs and wells should be sampled and chemically logged for As and Hg.

3. Gradient hole cutting should be chemically logged for As and Hg.

D. Geophysics

1. More gradient holes should be drilled. The number proposed is probably not sufficient to model adequately the temperature configuration.

2. Proposers do not have a complete understanding of what electromagnetic surveys (EM) can do relative to resistivity. Dipole-dipole resistivity, as well as EM, should be able to detect thermal fluids. There is need for a competent consultant in this area.

Drilling. The planned use of drilling mud to control artesian flow is not desirable. Geophysical well logging, chip analysis, and fluids sampling during drilling are not defined. A more detailed description of the drilling rig is required to determine its capability of drilling the production well.

Testing. Details of the testing phase are not given. Planned instrumentation appears inadequate. Details of reservoir enginering should be included.

End-Use. The proposed alcohol plant designs do not offer flexibility in accepting less than 600 gpm and 300°F. A review of the plant design is necessary to determine the feasibility of utilizing lower resource expectations, which might require scaling down the size of the plant. Possible cascaded uses of the 205°F rejected fluids are mentioned, but are not definitely planned and are not to be considered until after the ethanol plant is in operation.

Cost-Share. The cost-share formula requires reworking for lower resource expectations and revised plant designs. In general, the cost-share formula is not equitable, since DOE's cost-share increases too quickly for lower temperatures.

Personnel. The reservoir engineer shows ample computer modeling experience, but does not appear to have adequate field experience. There does not appear to be a hydrogeologist on the project team. There does not appear to be adequate environmental expertise on the project team. In general, personnel assignments to specific tasks are not clearly defined. The project team needs additional expertise in the areas of reservoir engineering, geophysics, exploration, and environmental/institutional issues. Gruy Federal appears to have limited experience in evaluating fracture-controlled hydrothermal reservoirs. There is a great potential for presumed conflict-of-interest in having Joel Renner on the project team because of his role in DOE's eastern Technical Assistance programs.

Permits. The proposer has not yet applied for permits for drilling, fluid disposal, etc., and does not indicate when they would be obtained. The legal rights to the geothermal fluids were not presented.

Institutional. The land, although it is owned by the proposers, is currently zoned for recreational use. Attempts at rezoning such land have met some opposition in the past and may present a hindrance to the project.

Environmental. Most environmental issues are dismissed in the proposal. No alternate plans are presented for fluid disposal in the event that the resource fluids are of lower quality than anticipated. The need of an injection well

is not discussed. The proposer's intent to obtain DOE approval of the environmental report in 10 days is ambitious. The proposer does not appear to familiar with recent NEPA regulations. Finally, the environmental report will need to address the National Historic Preservation Act, since local Indian tribes may have used the hot springs.

Conclusions

The TAC consensus was that there is significant potential for a resource of up to 230°F and 500 gpm, which are lower than the proposer's desired values. It is suggested that the proposer be requested to explore the technical and economical feasibility of using these resource parameters to meet his end-use requirements, e.g., by increasing heat exchanger sizes, scaling down plant size, etc. If no suitable end-use arrangement can be found, the TAC suggests that this proposal not be funded.

BUSINESS COMMITTEE SUMMARY

PROPOSAL: MAGIC RESOURCE INVESTORS No. 002

Score
Criterion 7 _____ / _____
Criterion 8 _____ / _____
Criterion 9 _____ / _____

SUMMARY

This proposal is generally medium quality with the proposer relying entirely on a subcontractor for accomplishment of technical aspects of the project. Some cost elements are unresonable. Total project cost $1,209,328.

BUSINESS STRENGTHS

1. A conservative 16% interest rate on borrowed captial is indicated.
2. A reasoned approach to project financing is demonstrated. However, there is no substance!
3. Cost controls are adequately addressed.
4. A sound organization structure exists.
5. Investors Wedum and Gorham are well capitalized relative to the financial requirements of the proposed project's front-end.
6. Gruy Federal is well-qualified to undertake the proposed project.
7. The proposer is financially secure.

BUSINESS WEAKNESSES

1. Lapsed time in the project is difficult to follow.
2. Travel costs A $41,635 are unreasonable and unjustified (although they are more than adequately described.)
3. Gruy Federal's contract being of a cost-plus-fixed-fee nature may give rise to cost control problems.
4. Engineering labor at a weighted $21.34 an hour (4,980 hours!) with 237.1% 6 1/2A and 01H application is unreasonable. DCAA audits have allegedly been conducted.
5. The project schedule in unclear.

6. There is no financial plan through the utilization point, i.e., an alcohol plant was provided.

7. Energy sales for raising revenue seem very naive and oversimplified.

8. No schedule detail is provided.

9. No specific role is defined covering the two wealthy investors identified.

10. The proposer is too reliant on the subcontractor. MRI's capability to manage a technical project of the magnitude proposed is highly suspect.

11. MRI is thinly capitalized; not very liquid--mostly land assets.

12. The claim to assets of the two wealthy investors is untreated.

13. No mention is made of pledged collateral possibilities.