GL008805

Attachment 1

# SUMMARY TECHNICAL EVALUATION REPORT

1. Contractor: Magic Hot Springs

2. SCAP No.: DE-SC07-80ID12139

3. Description: The project is to provide heat requirements for an Ethanol Production Plant.

4. Summary of Review:

A. Environmental

The land on the proposed site is zoned for recreational development and agriculture. Use of the site for the proposed industrial applications is dependent upon a zoning change. Attempts at rezoning this land appear to have met some opposition in the past. This issue needs to be resolved or else much of the reason for choosing this site for development will be defeated.

The proposer indicates that water quality is not expected to be a problem. Indeed the water chemistry data from the spring is very good for a geothermal resource, with the exception of a fluoride content of 10 ppm. Surface disposal, possibly directly into the Magic Reservoir, is planned. This has received tentative approval from the State, but since that time the proposed discharge rate has been increased by 300 gal/min. We assume that the State gave tentative approval to the original discharge based on a "grandfather" concept. Increasing the discharge would no longer allow the state this freedom. No reference is made to the thermal pollution potential. Both the thermal and fluoride effects of the proposed discharge will have to be presented in greater detail.

Disposal of drilling and testing fluids must be presented in greater detail. Firm and realistic contingency plans should be developed to deal with the possibility that the resource water quality may be worse than expected.

Legal right to the geothermal resource (preferably both a water right and a geothermal right) should be obtained. This will be especially crucial if the proposed use affects the flow or temperature of other geothermal resources of the area. No permits have yet been obtained for drilling and fluid disposal and the proposal text does not convey an understanding of which permits are specifically required.

Since much of the surrounding land is BLM, the Shoshone District should be contacted for environmental information, including terrestrial flora & fauna, sensitive species, heritage resource values, etc.

Many of the statements included in the Environmental/Institutional Sections are either technically incorrect or indicated inexperience with geothermal environmental concerns. The project team appears to need additional expertise to evaluate the environmental/ institutional issues that may be associated with the project.

The schedule shows only 4 weeks to obtain the necessary permits, leases, and approvals. This appears very optimistic, particularly if there is any opposition to the development.

The proposed cost share is too restrictive. The U.S.G.S. geothermometer for this site is 300 $\pm$ 29°F, yet at a flow rate of 675 gpm (more than they require) and a temperature of 280°F (certainly within the U.S.G.S.'s estimate), the project is considered a total failure. Either there is not a good match between the expected resource and the intended use, or the proposer's requirements for flow and temperature are too high. Also, 3,000 feet may be too shallow to be outside the zone of cold water influence. There should be some contingency to drill deeper; although if they encounter the main fracture system too shallow, they may be out of luck.

Plans presented that relate to the alcohol plant were not to be evaluated under this solicitation. Portions of the alcohol production plant, such as possible discharge of wastewater with a BOD content of 200 ppm into surface waterways, is clearly not acceptable.

B. Resource/Exploration

The proposer is overly optimistic in their anticipated flow and temperature. It is unlikely to encounter 300°F fluids at the target depth of 3000' and that it is equally unlikely to produce 675 gpm 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 gpm 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.

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.

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 presented 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 of 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. 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.

C. Drilling

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', the proposer should drill an 8-3/4" hole to TD ($\pm$ 3000').

A 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.

D. Cost

1. The overall estimated cost of $370,000 for a 3,000-foot production well is considered reasonable.

   a. Direct Labor--Staff/Advisory (Vol. II, pp. 16 and 19). Why are 4 man-weeks (168 hours) of this category required for Task III (exploration and gradient holes) while no such requirement exists for Task IV (production well)? What is the function of this category during Task III, especially considering the involvement of Senior Geologists, Senior Geophysicists, and Supervisory Engineers? This category should be reduced to no more than one man-week (40 hours) for Task III.

   b. Direct Labor--Supervisory Engineer/Geologist (Vol. II, p. 16), 520 hours. Why are 3 man-months proposed for this category when the drilling phase is estimated to require 3 x 7 = 21 days? Assuming a 16-hour-per-day supervisory requirement for the drilling period, then 16 x 21 = 336 hours seems a more reasonable estimate.

   c. Subcontracts (Vol. II, p. 17)

      1. Rig, 7 days at $3,570/day. The daily rate is reasonable assuming 24-hour-per-day operations. I feel the rig time can be reduced to 6 days by eliminating the requirement to run and cement 4 1/2-inch casing (see 2.c., above), resulting in a rig cost reduction of $3,570 for this item.

      2. Mobilization--$4,420. The cost is reasonable for initial rig mobilization and demobilization but should be reduced to a location-to-location move between gradient holes 1 and 2 and 2 and 3. Reasonable location-to-location move cost is $750 to $1,000. hourly

      3. Cementing and Service--$5,389. If the conductor pipe can be cemented from the surface with conventional ready-mix equipment and the 4-1/2 inch casing is eliminated, this item could be reduced by $4,500.

4. Bits 1-12 1/2-inch regular at $6,420. Standard bit size is 12 1/4-inch, not 12 1/2-inch; catalog price is $1,800; therefore, reduce this item by $4,600. If a 9 7/8-inch hole is used instead of a 12 1/4-inch hole (see 2.a. above), then bit cost is $1,200 and a further $600 reduction can be realized.

5. Casing. Replace 680 feet of 4 1/2-inch casing at $500/foot by 680 feet of 2-inch line pipe at $200/foot, resulting in a $2,040 reduction.

d. Subcontracts (Vol. II, pp. 20 and 21)

1. The quantities and types of materials and services are appropriate. The costs are reasonable with the exception of $14,974 for one "17 1/2 Regular" bit which, according to current catalogs, lists for $5,100.

2. Liner hanger costs for the 7-inch and 5-inch liner jobs are not included.

3. Permanent wellhead costs, i.e., 9 5/8-inch casing head and 10-inch flanged tee, are not included.

E. Testing

cannot do

The test plan is vague and the planned instrumentation is not adequate. The preliminary test plan should include estimated flow rates, test length and analysis procedures, as well as proper instrumentation. The thermal gradient wells should be used as monitor wells, at least during testing.

The costs presented for testing the well seem to neglect some critical areas such as pump installation and removal, and evaluation of flow data. These could easily add another $30,000.00 to project costs. The pump, pump column, and power system could add $25,000.00, and much more, to project costs.

F. Utilization

The chart shown on Page 27 of the proposal is incomplete, and certain of the mass balances are incorrect. This chart has been changed and is included in the attachment. The animal feed by-product should be 19.4 tons/day instead of 9.5 TPD, and the ethanol output has been changed to 3.86 GPM, assuming a 360-day operating year, per the proposal.

The projected flow of 600-675 GPM of 280-300°F geothermal water is more than adequate to satisfy the needs of a 2 MMGPY ethanol plant. A 600 GPM flow of 280°F water translates to an available energy supply of 92,500 BTU/GAL ETOH.

The conservatism described above may be warranted, as additional energy will no doubt be necessary for space heating and freeze protection in the 8000 DEGREE-DAY environment. No information was provided in the proposal to enable assessment of these demands.

The proposers have incorrectly estimated the barley and cheese whey feedstock requirements for the ethanol plant. The projected purchases of 268,600 BUSHELS/YR and 54,750 TONS/YR, respectively, are sufficient for ethanol production of only 945,250 GALS/YR, less than half of the 2 MMGPY projected plant output. The feedstock cost turns out to be 88¢/GAL, instead of 83¢ as reported by the proposers.

Based on the energy requirement of 60,000 BTU/GAL ETOH and a 2 MMGPY plant, the minimum resource requirements were redefined.

i) At flow rates in excess of 675 GPM, 250°F is a viable minimum resource temperature.

ii) At 300°F, only 300 GPM is required to process the ethanol and dry the stillage.

iii) At the 265°F resource limit offered by the proposer, 300 GPM is sufficient flow to enable ethanol processing, but not to dry the grains.

G. Cost Share

The cost share plan is user-oriented. It defines success as $\geq$ 300°F and the text states a need of 280°F.

H. Recommendations

1. Provide copies of state regulations governing drilling, completion, disposal options, and reinjection, as they apply to your specific geothermal project.

2. Identify the present zoning status for the proposed project site.

3. Identify the thermal and fluoride effects of the proposed discharge effluents.

4. Identify the disposal options for the drilling and testing fluids.

5. Provide drilling and water appropriation permits to DOE before award.

6. Identify who is to develop the environmental report. The environmental issues and subsequent report associated with this project will be the first milestone of the cooperative agreement. Rejects, time delays, and cost overruns could be avoided if a qualified individual or firm were selected, and with DOE's cooperation, begun early to prepare the environmental report.

7. Identify the status of the lease applications on the surrounding BLM land.

8. Provide details of your financial arrangements for the participant's cost share for this project.

9. A flow rate greater than 675 gpm and a temperature greater than 300°F is highly unlikely. A temperature of 260°F and a flow rate of 500 gpm would probably be the expected well parameters and, consequently, the basis for successful well criteria (than is 20% DOE participation).

10. A dipole-dipole geophysical technique should be used to detect thermal fluids instead of the EM method proposed.

11. Drill five or six 500'-600' temperature gradient holes rather than the three 1000' holes as the proposer calls for.

FEB 17 1981

Steelsight

EG&G Idaho, Inc.

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February 9, 1981

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TECHNICAL EVALUATION REPORT FOR "MAGIC HOT SPRINGS" - SCAP NO. DE-SC07-80ID12139 - DBLO-29-81

Dear Dr. Mink:

The Magic Hot Springs proposal has been evaluated for technical and cost reasonableness. The project is to provide heat requirements for an ethanol product plant. The project calls for completing geological and geophysical surveys and drilling three-1000 ft thermal gradient holes, and a 3000 ft production well. A successful project is defined as having a flow rate of greater than 675 gpm at $\geq$ 300°F.

The cost-share plan is user-oriented. There are surface manifestations of resource temperatures of at least 165°F, but a significantly reduced chance of encountering a 300°F resource. In addition, two wells will probably have to be drilled to produce the required flow of 675 gpm. Therefore, a reasonable cost-share for a successful well should be 260°F with a flow rate of 500 gpm.

The technical designs and economics of the end use are adequate if resource expectations are satisfied for the process.

Additional requirements, revisions, and comments are discussed in Attachment 1 to this letter and are forwarded for your consideration during the contract negotiation phase.

Very truly yours,

E. G. DiBello, Manager
Geothermal Programs Office

JAS:dfs

Attachment:
As stated

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