

**STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION**

**IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:**

**CASE NO. 14246
ORDER NO. R-13127**

**APPLICATION OF RASER POWER
SYSTEMS, LLC, FOR APPROVAL OF A
DISCHARGE PLAN PURSUANT TO THE
WATER QUALITY ACT, HIDALGO
COUNTY, NEW MEXICO.**

ORDER OF THE DIVISION

BY THE DIVISION:

This case came on for hearing at 9:00 a.m. on December 1, 2008, and April 7, 2009 at Lordsburg, New Mexico, before Hearing Officer David K. Brooks.

NOW, on this 29th day of May, 2009, the Division Director, having considered the testimony, the record and the recommendations of the Hearing Officer,

FINDS THAT:

Background and Procedure

(1) Due public notice has been given, and the Division has jurisdiction of the subject matter of this case.

(2) Los Lobos Renewable Power, LLC ("Applicant" or "Los Lobos"), a subsidiary of Raser Power Systems, LLC, filed an administrative application with the Environmental Bureau of the Division for approval of a discharge plan pursuant to the New Mexico Water Quality Act [NMSA 1978, Sections 74-6-1 through 74-6-17] and applicable rules of the Water Quality Control Commission ("WQCC"), for a geothermal power generating facility ("the facility") to be located in the NE/4 SW/4 of Section 7, Township 25 South, Range 19 West, NMPM, in Hidalgo County, New Mexico.

(3) After initial public notices were given, Americulture, Inc. ("Americulture" or "Protestant") protested the application. The Director of the Division ("the Director")

determined, pursuant to 20.6.2.3108.K NMAC, that there was substantial public interest in this application, and designated a hearing officer to conduct a public hearing in accordance with 20.6.2.3110 NMAC. The hearing was convened only to consider approval, disapproval or conditional approval of the proposed discharge plan. No issue under the Geothermal Resources Conservation Act [NMSA 71-5-1 through 71-5-24] was addressed in this proceeding.

(4) At the initial hearing on December 1, 2008, Applicant and the Division each appeared through counsel and presented evidence in support of the proposed discharge plan. Protestant appeared through a non-attorney corporate representative and presented evidence in opposition.

(5) The evidence at the initial hearing showed that:

(a) applicant intends to locate one of three proposed Class V injection wells included in the discharge plan at a location different from that indicated in the application and in the original public notice; and

(b) the Division staff had not yet obtained all of the technical information it needed from Applicant and had not finalized its recommendations for conditions to be included in a final draft permit.

(6) In order to provide public notice of the changed location of one of the injection wells and to allow the Division to complete a recommended draft permit, the Hearing Officer recessed the hearing. The hearing re-convened pursuant to a new hearing notice on April 7, 2009, at which time Applicant, the Division and Protestant appeared and presented additional evidence, and the Division offered in evidence a revised draft permit. After the hearing, the Division staff filed a further, non-substantive revision of its draft permit. Because the Division did not file its final draft permit 30 days prior to the hearing, the Hearing Officer re-opened the record to allow Protestant to file comments on the final draft permit. The Protestant filed comments, and the administrative record was finally closed on May 4, 2009.

The Evidence

(7) Applicant's witnesses, Michael Hayter and Roger Perry, testified that Applicant proposes to construct a binary-cycle geothermal power generating facility, including five geothermal production wells ("the production wells") that will lift geothermal water from approximately 3,400 feet below the surface, presumably from the Horquilla Limestone formation, and three water injection wells ("the injection wells") that will re-inject the spent geothermal waters, together with waste water from the plant's cooling tower, into the source formation. Applicant anticipates that the subterranean heat source will re-heat the injected water and allow it to be re-produced for further geothermal use.

(8) The cooling tower water will be produced from a water supply well located in proximity to the facility. It will be treated with biocides and anti-corrosion agents.

(9) Applicant presented a witness, Jennifer Wright, from NALCO, the company which designed the chemical treatment program for the cooling tower water. Ms. Wright testified that the chemical agents that would be introduced into the cooling tower water, in the quantities that would be used, would not cause the water to exceed WQCC water quality standards, nor introduce any toxic pollutants. Ms. Wright also described the 3D-TRASER system that would monitor and control the levels of chemical agents used in the water treatment process to prevent introducing excessive amounts of these agents.

(10) The Division's witness, Carl Chavez, an environmental engineer, described the Division's application review process and the provisions of the proposed draft permit, including the groundwater monitoring requirements included in the draft permit and the tables attached thereto.

(11) Protestant presented the testimony of James Witcher, a hydro-geologist with substantial experience studying the area where the facility will be located. Mr. Witcher offered a detailed interpretation of the region's geology. He specifically testified that the geothermal water so far discovered and produced in the area could not have originated in or moved through the Horquilla Limestone, the formation which Applicant's witness posited as their geothermal source formation, because the chemical qualities of waters produced from Protestant's wells and other geothermal wells in the vicinity indicate that those waters have never moved through a carbonate reservoir.

(12) Though he did not give any specific opinions about hydrologic connections between formations, Mr. Witcher expressed concerns about the injected water's potential to migrate into aquifers from which Protestant and others are producing fresh water. He recommended that the proposed discharge plan be rejected until the Applicant can present further evidence of geologic conditions that could only be obtained by drilling one or more test wells.

(13) Mr. Witcher also expressed a concern that the monitor wells required in the proposed draft permit would be ineffective to monitor water in the aquifers as they were intended to do because of the draw-down of the water table that would result from the proposed operation.

(14) Both Applicant's and Protestant's witnesses testified that no testing had been done on the water in the Horquilla Limestone formation. There was discussion of water tests indicating concentrations of total dissolved solids (TDS) in the range of 1,000 to 1,500 milligrams per liter (mg/l), but it was uncontested that these results were from tests of shallower formations, and not of Horquilla.

(15) No party presented any specific evidence regarding hydrologic connection or lack thereof between the Horquilla and any of the shallower aquifers in the vicinity.

(16) Protestant is in the business of commercial production of Tilapia fish for human consumption. Protestant has a fish farm close to the facility. During the hearing, Protestant's corporate representative, Damon Seawright, made various non-specific observations about water quality considerations that might affect the particular species of fish that Protestant produces, but Mr. Seawright was not sworn, did not testify as a witness and offered no expert or factual testimony, or other evidence, about these matters.

(17) In addition to the parties who entered appearances, several residents of Hidalgo County made comments at the hearing. All supported Los Lobos' application.

Division Director's Findings and Conclusions

(18) Each of the following findings shall constitute findings of fact to the extent that they address factual issues, and conclusions of law to the extent that they address legal issues.

(19) The proposed permit authorizes construction and operation of lined reserve pits at the wells, evaporation ponds, and other elements, in addition to the three Class V injection wells. However, there was no controversy at the hearing concerning these pits, ponds or other elements, and the Director accordingly accepts the conclusion of the Division staff, as evidenced by the staff's endorsement of the draft permit, that these elements present no hazard to any underground source of drinking water.

(20) The controversy at the hearing focused exclusively on the proposed injection wells. The governing standard for determining whether these wells should be permitted is set forth in 20.6.2.3109.C NMAC. That subsection reads, in pertinent part, as follows:

[t]he secretary shall approve the proposed discharge plan, modification or renewal if the following requirements are met:

(2) the person proposing to discharge demonstrates that approval of the proposed discharge plan, modification or renewal will not result in either concentrations in excess of the standards of 20.6.2.3103 NMAC or the presence of any toxic pollutant at any place of withdrawal of water for present or reasonably foreseeable future use, except for contaminants in the water diverted as provided in Subsection D

(21) The referenced Subsection D provides, in pertinent part, as follows:

The secretary shall allow the following unless he determines that a hazard to public health may result:

(1) the weight of water contaminants in water diverted from any source may be discharged provided that the discharge is to the aquifer from which the water was diverted or to an aquifer containing a greater concentration of the contaminants than contained in the water diverted; and provided further that contaminants added as a result of the means of diversion shall not be considered to be part of the weight of water contaminants in the water diverted . . .

(22) Since the injection wells in this case will discharge the same water that was diverted into the same aquifer from which it was diverted, Subsection D of 20.6.2.3109 NMAC applies in this case and counsels approval of the application *unless* the addition of cooling tower water introduces toxic pollutants or other water contaminants that could introduce or cause the water in the injection zone to exceed standards.

(23) There was some discussion during the second hearing about the possibility of injection into an "intermediate zone" between the shallow aquifers from which ground water is now being produced and the geothermal source formation. This possibility, however, need not be considered since the draft permit would not authorize such injection. Paragraph 21.F of the draft permit specifically provides that the injected fluids will be injected into "the geothermal reservoir." From a reading of the entirety of Paragraph 21.F, it is plain that it authorizes injection only into the reservoir from which the geothermal water was produced, be it the Horquilla or some other formation. Injection into an "intermediate formation" would require a permit modification.

(24) The testimony of the NALCO witness, Ms. Wright, established, *prima facie*, that the proposed chemical treatment of the cooling tower water will not cause an exceedance of standards or introduce any toxic pollutant. Protestant offered no contrary evidence. Speculation by a party representative speaking in the role of counsel is not evidence.

(25) The Division proposes further conditions in the draft permit to insure that addition of the treated cooling tower water to the injected fluids will not cause an exceedance of water quality standards or introduce toxic pollutants. Clause (ii) of Paragraph 20.E of the draft permit requires frequent testing and analysis of the fluids to be injected, prior to injection. Clause (v) of Paragraph 20.B expressly requires immediate shut-down "if the concentration of the injection fluids exceed the greater of the standards specified in WQCC 20.6.2.3103 NMAC or background, or if any toxic pollutant . . . is detected." Applicant has indicated that it will accept these permit conditions.

(26) There is an ambiguity inherent in the use of the term "background" in Paragraph 20.B since the draft permit requires numerous different background tests at

different locations. To resolve this ambiguity, the relevant provision of Clause (v) of Paragraph 20.B of the draft permit should be changed to read:

if the concentration of any water contaminants in the injection fluids exceeds the greater of the standards specified in WQCC 20.6.2.3103 NMAC or background [as established for the injection formation at the injection well location pursuant to Clause (i) of Paragraph 21.D], or if any toxic pollutant . . . is detected.

(27) Protestant's corporate representative, Mr. Seawright, suggested that use of a water tower for cooling, with the attendant necessity to dispose of waste water, might not be the best available technology for the facility, since air cooling could be used. Applicant's witnesses, however, testified that air cooling would not be practical for this facility. Protestant offered no evidence to the contrary. Indeed, Protestant's sole witness, Mr. Witcher, expressly disclaimed any expertise in power plant cooling technology.

(28) Based on Findings (22) through (27), the Director concludes that operation of the proposed Class V injection wells in accordance with the proposed draft permit, as modified in Finding (26), will comply with the applicable standards of Subsections C and D of 20.6.2.3109 NMAC *unless* the injection process causes excursion of the injected fluids, or migration of other waters, into another aquifer (distinct from the source formation) so as to cause an exceedance of standards or background in that aquifer.

(29) Subsection D of 20.6.2.3109 should not be construed to permit re-injection into a source aquifer if the injected fluids cannot be effectively confined to that aquifer or if the injection process itself causes an exceedance of standards in another aquifer.

(30) The evidence in this case is not sufficient to demonstrate the characteristics of, or even the identity of, the injection formation, nor does it demonstrate whether or not hydrologic communication exists between the injection formation and other aquifers in the vicinity that are or may be underground sources of drinking water. The low injection pressure (75 psi) proposed according to the testimony of Applicant's witnesses may suggest that induced migration from the injection zone is unlikely, but does not, in this unknown environment, necessarily demonstrate that it will not occur.

(31) These considerations would tend to support the approach recommended by Protestant's witness, Mr. Witcher, of requiring Applicant to drill exploratory wells and furnish additional data prior to approval of permits for the proposed Class V injection wells.

(32) However, Applicant presented testimony that it would be difficult to secure financing for the necessary exploratory work absent issuance of a permit.

(33) The Division's approach, as evidenced by the draft permit, and the testimony of the Division's witness as to the reasoning supporting certain permit

conditions, has been to impose permit conditions which will allow early detection and response if any excursion of injected fluids or induced migration is discovered.

(34) In view of the unknown geologic environment and the difficulty of obtaining more definitive information, the Director concludes that the Division's approach is a viable one. Accordingly, if the permit conditions are sufficient to allow timely detection and intervention of any process that may cause an exceedence of standards or applicable background in another aquifer, or at another location, the Division can properly conclude that the standard for permit approval established by Subsection C of 20.6.2.3109 NMAC is satisfied.

(35) In any injection well, the first line of defense for preventing excursion of the injected fluids into a formation other than the approved injection formation is the well's casing program. The casing program provided in the draft permit (Paragraph 21.B) is extremely general, doubtless because, as pointed out by Protestant's witness, Mr. Witcher, one does not know where to set casing until one has some knowledge of the stratigraphy. However, the casing program should not be left to chance, or to Applicant's unsupervised discretion. Accordingly, Paragraph 21.B of the draft permit should be amended to require Applicant, prior to setting intermediate or production casing in each of the production and injection wells, to run open hole logs, pursuant to a logging program approved by the Division, and submit the logs to the Division for review together with Applicant's recommendations for casing setting depths, and, in the case of injection wells, for precise definition of the injection interval. Furthermore, Paragraph 21.B should be further amended to require injection to be accomplished through tubing suitable for the character of the injected fluids, to be determined after initial testing of the fluids to be injected. The tubing should be installed in a packer set within 100 feet of the uppermost injection perforations. The casing-tubing annulus should be filled with an inert fluid, and a gauge or approved leak-detection device should be attached to the annulus in order to detect leakage in the casing, tubing or packer.

(36) Although the evidence in this case indicates that injection pressures will be sufficiently low that formation fracture problems are unlikely, Paragraph 21.G of the draft permit, relating to well pressure limits, should be amended to specifically require the Applicant, after testing the injection formation, to report the intended maximum injection pressure to the Division for approval prior to commencement of injection. The injection pressure shall not exceed 0.2 psi per foot of depth from the surface to the top of the injection interval, unless the Applicant secures Division approval for an increase based on demonstration that the increase will not involve a hazard of formation fracture.

(37) Paragraphs 20 and 21 of the draft permit, and the tables attached to the permit, require an extensive ground water monitoring program, and require notification to the Division within 72 hours if any test reveals an exceedence of the higher of WQCC standards or background at any monitoring location, or if any toxic pollutant is encountered. The Division's witness, Mr. Chavez, testified that this monitoring program would be sufficient to provide prompt detection of any introduction of pollutants into existing, identified aquifers resulting from operation of the injection wells. With certain

qualifications indicated below, the Director concludes that the monitoring, testing and reporting requirements of the draft permit are adequate to meet the standards of the applicable WQCC regulations.

(38) In order to address concerns that were articulated at the hearing or in the responses filed, or that arise from the terms of the draft permit, the groundwater monitoring provisions of the draft permit should be modified as follows:

(a) Protestant has requested that its Americulture State Well No. 2 be added to the list of water supply wells to be monitored and tested, as set forth in Table 3 attached to the draft permit. Although no evidence was presented to indicate that monitoring this additional well would produce better or different data, Mr. Chavez testified that the Division staff did not object to adding this well to the list of wells to be tested, and this requested change to the draft permit should be made.

(b) Protestant's witness, Mr. Witcher, articulated concerns that the drawdown of the water table resulting from operation of the facility would render the monitoring wells ineffective (Transcript of 4-7-09 hearing at 143-45). Neither Applicant nor the Division presented any responsive evidence concerning this issue. Accordingly, Clause (i) of Paragraph 20.B of the draft permit, which requires Applicant to prepare a monitoring plan for approval of the Division, should be amended to direct Applicant to specifically address Mr. Witcher's concerns in its monitoring plan, and to describe measures to be promptly taken to remedy the problem if the monitoring wells cease to function.

(c) To avoid any ambiguity, since the draft permit requires extensive background sampling at various locations, the 72-hour notification provision in Clause (viii) of Paragraph 20.B of the draft permit should be amended to require that the notification requirement is triggered if:

"the concentration of a monitor well sample exceeds the greater of the water quality standards specified in WQCC 20.6.2.3103 NMAC or the background established at that well's location pursuant to the monitoring program described in this paragraph, or if any toxic pollutant is detected, . . ."

(d) Protestant objected to the notification provision as inadequate to remedy any exceedence that might be detected at a location other than an injection well, and pointed out that while Clause (v) of Paragraph 20.B of the draft permit requires shut-down of the facility if an exceedence is detected at an injection site, no comparable requirement exists if an exceedence is detected elsewhere. A distinction between the response required to an exceedence at the injection site and an exceedence at another location is appropriate, since an exceedence at another location would not necessarily be attributable to the operation of facility. However, in this case, where the geologic evidence the

Division would normally require to demonstrate that the injected fluids will be confined to the injection zone is absent, the Division must rely on the adequacy of the permit's requirements for early detection and remedial action to justify a finding that an exceedence in another formation will not result. Accordingly, Clause (viii) of Paragraph 20.B should be amended to expressly require that, in the event of an exceedence as described in that clause occurs, the Applicant, if so ordered by the Division, shall shut down the operation for such time as may be necessary to allow the Division to investigate the cause of the exceedence. If the Division determines that the operation of the facility contributed to the exceedence, it can then invoke the permit modification provisions of Paragraph 5 of the draft permit, as explained by the Division's witness, Mr. Chavez, in his testimony at the hearing.

(39) The Director determines that the draft permit, if modified in accordance with Finding Paragraphs (35) through (38), meets the standard for permit approval provided in 20.6.2.3109.C(2) NMAC.

(40) Paragraph 20.A of the draft permit requires that Applicant conduct an aquatic toxicity test on the Tilapia fish species present at Protestant's facility. Applicant indicated that it will accept this condition. Accordingly, there is no issue about this requirement except that Protestant has argued that Applicant should be required to make a more extensive demonstration that the injected fluids cannot harm Protestant's fish or those who consume Protestant's fish. Such a showing would be required only by applicable WQCC rules only if there were evidence that the injected fluids might contain one or a combination of the potential "toxic pollutant" substances specifically listed in 20.6.2.7.WW NMAC, which is not the case here.

(41) There are some additional provisions of the draft permit that were not explained at the hearing, and that seem to have questionable relevance, and should be modified or deleted:

(a) Paragraph 6 contains an apparently erroneous reference to Class II (oil and gas-related) wells, which are not contemplated in connection with this facility. This provision should be corrected or deleted.

(b) Paragraph 13 requires closure of all Class V wells, without excluding the Class V injection wells that are the subject of the permit. This provision should be deleted unless there are other Class V wells to which it applies, in which event it should be corrected to make clear to what it applies, and to expressly exclude the Class V injection wells contemplated by the permit.

(42) The Division staff should be instructed to revise/correct the draft permit as set forth in this Order. The Applicant's discharge plan should be approved subject to the conditions set forth in the draft permit and the additional conditions described herein.

IT IS THEREFORE ORDERED THAT:

(1) Pursuant to 20.6.2.3109 NMAC, the application of Los Lobos Renewable Power Systems, LLC, a subsidiary of Raser Power Systems, LLC, for a discharge permit for construction and operation of a binary-cycle, geothermal power generating facility to be located in the NE/4 SW/4 of Section 7, Township 25 South, Range 19 West, in Hidalgo County, New Mexico, is hereby granted.

(2) Applicant shall be authorized, subject to approval of Applications for Permits to Drill (APDs) by the Division's Artesia District Office, to construct three Class V injection wells at the following locations in Hidalgo County, New Mexico:

Well No. 42-18, to be located 1307 feet FNL and 2123 feet FWL (Unit C) in Section 18, in Township 25 South, Range 19 West, NMPM

Well No. 51-07, to be located 169 feet FNL and 2407 feet FEL (Unit B) in Section 7, in Township 25 South, Range 20 West, NMPM

Well No. 53-12, to be located 1575 feet FNL and 3350 feet FWL (Unit K) of Section 12, in Township 25 South, Range 19 West, NMPM

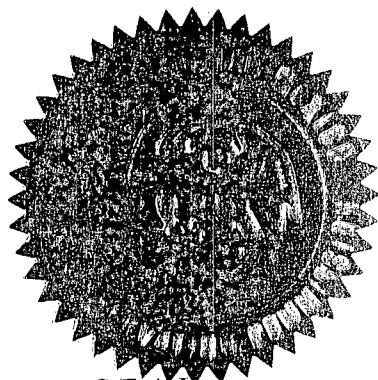
(3) Subject to approval of construction and authorization for start-up, Applicant is authorized to employ the above described wells for injection of produced geothermal waters and power plant cooling tower effluent into the source formation from which the injected geothermal waters were produced.

(4) Approval of this application is subject to the conditions of the final permit, which shall include the conditions provided in the draft permit presented in evidence at the hearing of this case, as amended pursuant to this Order, and the additional conditions described in this Order.

(5) The staff of the Division's Environmental Bureau is directed to revise the draft permit to incorporate the changes and additions described in the finding paragraphs of this Order, and to present the revised draft permit to the Director for signature and transmission to the Applicant for acceptance.

(6) Jurisdiction of this case is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.



SEAL

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

A handwritten signature in dark ink, appearing to read "Mark E. Fesmire".

MARK E. FESMIRE, P.E.
Director