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

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

APPLICATION OF AGAVE ENERGY COMPANY FOR AUTHORITY TO INJECT, LEA COUNTY, NEW MEXICO

CASE NO. 14720
Order No. R-13507

ORDER OF THE COMMISSION

This case came for hearing on December 8 and December 9, 2011 at Santa Fe, New Mexico, before the Oil Conservation Commission (Commission), and the Commission having deliberated on December 9, 2011,

NOW, on this 23rd day of January, 2012, the Commission, having considered the testimony, the record, and the arguments of the parties, and being otherwise advised;

FINDS THAT:

A. Agave's Application

1. On July 20, 2010, Agave filed its application for authority to inject with the Oil Conservation Division (the Division).

2. Agave proposes to operate an acid gas injection (AGI) well called the Red Hills AGI #1, which will be located 1600 feet from the South line and 150 feet from the East line of Section 13, Township 24 South, Range 33 East, NMPM, in Lea County.

3. On August 30, 2011, Agave filed with the Commission modifications to its application that address certain design elements of the AGI well.

4. Agave provided personal notice, via certified mail, of the submission of its application and the Commission hearing to all operators, surface owners, and lessees within a one-mile radius of the surface location of the proposed AGI well.

5. Public notice of the submission of Agave's application and the Commission hearing was published in *The Lovington Leader.*

6. Agave's application requests authorization to utilize the AGI well to dispose of treated acid gas (TAG) containing carbon dioxide (CO_2) and hydrogen sulfide (H_2S) from Agave's Red Hills Gas Processing Plant (Red Hills Plant or the Plant) by injecting the TAG stream into the Cherry Canyon Formation at a depth between 6,200 and 6,530 feet.

7. Agave's application further requests authorization of a maximum surface injection pressure of 2,085 pounds per square inch (psi) and a maximum daily injection rate of 13 MMSCFD.

8. In support of the application, Agave presented direct and rebuttal testimony by its operations manager, engineer Ivan Villa, its environmental engineer, Jennifer Knowlton, and its consulting geologist, Alberto Gutierrez of Geolex, Inc.

B. Opposition to Application

9. Kaiser-Francis Oil Company (Kaiser) opposes Agave's application.

10. Kaiser operates the South Bell Lake Unit, which is located north of the proposed AGI well in Section 12, Township 24 South, Range 33 East and in Sections 7 and 8, Township 24 South, Range 34 East.

11. The southern boundary of the South Bell Lake Unit is 0.67 miles from the surface location of the proposed AGI well.

12. In support of its opposition, Kaiser presented direct testimony by petroleum engineer James Wakefield of Kaiser-Francis Anadarko, LLC.

C. Red Hills Plant

13. Agave owns the surface where the Red Hills Plant is being constructed and the AGI well will be drilled.

14. Agave's decision to construct and operate the Red Hills Plant was based on an anticipated increase in gas production in the area, including production from the Avalon shale play.

15. Agave commenced construction of the Red Hills Plant in August 2011, and plans to begin operating the Plant in March 2012.

16. Agave is constructing the Plant and the pipeline to the proposed AGI well in accordance with best available practices.

17. The initial design capacity of the plant is 60 MMSCFD.

18. As gas production in the area increases, Agave will expand the capacity of the Red Hills Plant to 120 MMSCFD.

19. Initially, the Red Hills Plant will receive sweet gas containing CO_2 from field operators for processing.

20. Subsequently, the Plant will begin receiving sour gas containing H_2S and increased amounts of CO_2.

21. Agave's application is based on the eventual Plant capacity of 120 MMSCFD and a corresponding maximum daily injection rate of 13 MMSCFD; however, given the initial injection rate of 2 to 5 MMSCFD of CO_2, which will increase over time, Agave has calculated the actual average daily injection rate over a thirty-year period to be 7.8 MMSCFD.

D. Disposal of CO_2 and H_2S

22. When it commences processing sweet field gas at the Red Hills Plant, Agave will dispose of the CO_2 by venting it into the atmosphere.

23. Once it begins receiving sour field gas with H_2S and a higher CO_2 content, Agave will inject the CO_2 and H_2S into the AGI well.

24. The TAG stream from sour gas processing at the Red Hills Plant will be comprised of 95%-100% CO_2, 0%- 5% H_2S, and trace components of C_1 – C_6 and nitrogen.

25. Disposing of the CO_2 and H_2S into the AGI well will enable Agave to: (a) more efficiently operate the Red Hills Plant and the associated gathering system; and (b) rapidly adjust to variations in the inlet gas received for processing.

26. Injection of the TAG stream from the Plant also will relieve field operators of the responsibility for treating H_2S in the field, thereby making their operations safer and more efficient.

E. Geologic Characteristics of the Injection Zone

27. Mr. Gutierrez testified that he evaluated potential injection zones based on existing and potential oil and gas production and reservoir geology.

28. The Cherry Canyon Formation is composed of sandstones interbedded with siltstones and limestones, and the Upper Cherry Canyon Formation is composed of five clean sand units that are laterally continuous.

29. Mr. Gutierrez testified that he selected the injection zone in the Cherry Canyon Formation because it: (a) is separated from the Delaware sands, and capped by,

900 feet of sand interbedded with tight limestones, shales, and siltstones; (b) is sealed below by the Brushy Canyon Formation; and (c) consists of five gently sloping sand beds.

30. Mr. Gutierrez further testified that the injection zone has an average thickness of 177 feet and an average porosity of 18.9%.

31. Additionally, Mr. Gutierrez testified that there are no open fractures, faults or hydrogeological connections between the injection zone and producing and water-bearing zones.

32. Mr. Wakefield testified that he considers the injection zone to be a continuous depositional feature with a hydraulic communication between the proposed AGI well and the South Bell Lake Unit.

F. TAG Plume

33. Agave projects that the total amount of CO_2 and H_2S to be injected over a thirty-year period will be 210 MMCF.

34. Messers. Gutierrez and Wakefield offered differing opinions regarding the potential for off-site migration of the TAG plume created by injection into the AGI well.

35. Based on his experience with produced water injection and his opinion regarding the elevation between the AGI well and the southern boundary of the South Bell Lake Unit, Mr. Wakefield testified that the injected TAG will displace saline water in the injection zone, and that the injection plume will migrate northward and negatively impact existing and future producing wells in the South Bell Lake Unit.

36. Citing to his modeling of the size of the injection plume after thirty years of injection at an average rate of 7.8 MMSCFD, Mr. Gutierrez testified that the radius of the plume will be 313 acres, or 0.39 miles, and concluded that there will be a safe distance between the outer edge of the plume and existing and future wells in the South Bell Lake Unit.

37. He also testified that, due to the reservoir geology, any updip migration of the TAG plume will be minimal and that the preferential migration, if any, will be to the east towards the maximum porosity and permeability.

38. On rebuttal, Mr. Gutierrez testified that Mr. Wakefield overstated the difference in the elevation between the southernmost well in the South Bell Lake Unit and the proposed AGI well, and that the elevation actually is 100 feet rather than 400 feet as suggested by Mr. Wakefield.

39. Mr. Gutierrez also countered Mr. Wakefield's testimony concerning the displacement of saline water in the injection zone by citing to recent studies

demonstrating that significant amounts of injected CO_2 and H_2S are stored as hydrates within saline reservoirs, thereby substantially reducing the spread of injection plumes, and observing that, as a result, his calculation of the radius of injection plume is actually conservative.

G. Well Design

40. Agave has submitted an application for a permit to drill to the Bureau of Land Management (BLM), which the BLM has deemed to be complete, and has submitted the requisite bond to the BLM.

41. The total depth of the AGI well will be 6,550 feet.

42. As designed, the AGI well will include production casing to 6,550 feet, intermediate casing to 5,190 feet, and surface casing to 1,245 feet.

43. Each string of telescoping casing will be cemented to the surface.

44. The well's safety features include a corrosion-resistant well tree, packer, and subsurface safety valve, a corrosion-resistant casing joint to set the packer, a check valve and adjustable choke at the packer to control optimum injection pressures, the use of acid-resistant cement in the first stage around the packer annulus, and the loading and pressure monitoring of an inert fluid (diesel) in the annulus between the tubing and the casing.

H. Groundwater and Producing Zones

45. There are no fresh water wells within a one-mile radius of the proposed AGI well.

46. The fresh water aquifers within the one-mile radius are found in the Ogalalla and Santa Rosa Formations to a depth of approximately 650 feet.

47. Groundwater containing more than 10,000 TDS is present in the Rustler Formation at depths of 1,200 to 1,600 feet.

48. The fresh water aquifers are protected by thick Salado anhydrite and Castile salt deposits.

49. All of the water-bearing zones will be protected by the surface casing of the AGI well as well as the intermediate casing, which will extend to a depth of 1,900 feet through the Rustler Formation and approximately 250 feet into the Salado Formation.

50. Three plugged and abandoned Morrow wells, one active Bone Springs producing well, one plugged and abandoned Bone Spring well, and one plugged and

abandoned Delaware Sand well penetrate the injection zone within a one-mile radius of the AGI well.

51. The casing of the AGI well will be set in a manner that will protect potential oil and gas production in all producing zones uphole from the injection interval.

I. Environmental and Safety Benefits

52. Agave's injection of CO_2 from the Red Hills Plant will effectively eliminate CO_2 emissions from the Plant.

53. Ms. Knowlton testified that when the Plant operates at its initial maximum design capacity of 60 MMSCFD, the injection and sequestration of CO_2 will eliminate approximately 89,000 tons of CO_2 emissions on an annual basis.

54. Ms. Knowlton further testified that the injection of H_2S will effectively eliminate flaring as a control for the sulfur derived from the processing of sour gas at the Red Hills Plant.

55. Ms. Knowlton also testified that: (a) Agave will submit to the Division's Environmental Bureau an H_2S Contingency Plan for the Plant and the proposed AGI well that will be modeled after Agave's approved H_2S Contingency Plan for its Dagger Draw Gas Processing Plant and the associated Metropolis AGI well; and (b) Agave will not commence injection into the proposed AGI well until the Division's Environmental Bureau has approved the H_2S Contingency Plan.

CONCLUSIONS

1. The Commission has jurisdiction over the parties and the subject matter of this case.

2. Proper public notice has been given.

3. Proper individual notice has been given to all operators, surface owners, and lessees within a one-mile radius of the AGI well.

4. The AGI well will be constructed in a manner that will prevent any movement of CO_2 and H_2S from the injection zone to the surface.

5. Because water is heavier than acid gas, the pressure gradient of the injected TAG stream shall be allowed to exceed the Division's normal pressure gradient of 0.2 psi.

6. Agave's request for a maximum surface injection pressure of 2,085 psi should be approved.

7. Agave's injection of CO_2 and H_2S can be conducted in a safe manner without causing waste, impairing correlative rights, impacting oil and gas producing zones, or endangering fresh water, public health, or the environment.

8. Agave's proposed injection of CO_2 and H_2S is an environmentally superior means of disposing of the TAG stream from the Red Hills Plant because it will eliminate greenhouse gas and sulfur emissions.

IT IS THEREFORE ORDERED THAT:

1. Agave's application is granted and Agave is hereby authorized to drill and operate an AGI well located 1600 feet from the South line and 150 feet from the East line of Section 13, Township 24 South, Range 33 East, NMPM, in Lea County to dispose of TAG containing CO_2 and H_2S from Agave's Red Hills Plant or the Plant by injecting the TAG stream into the Cherry Canyon Formation at a depth between 6,200 and 6,530 feet with the following conditions:

a. Agave shall perform a mechanical integrity test on the AGI well before it commences injection and every two years thereafter; all mechanical integrity testing procedures shall follow the requirements in 19.15.26.11.A NMAC;

b. Agave shall use an acid gas resistant cement in completing the AGI well;

c. the wellhead injection pressure on the well shall be limited to no more than 2,085 psi;

d. Agave shall install a pressure limiting device on the well to ensure that the maximum allowable surface pressure of 2,085 psi is not exceeded;

e. the maximum rate of injection of CO_2 and H_2S is 13 MMSCFD;

f. a one-way subsurface automatic safety valve shall be placed on the injection tubing approximately 250 feet below the surface to prevent the injected acid gas from migrating upwards in case of an upset or emergency;

g. the packers and tubing shall be corrosion-resistant;

h. Agave shall, pursuant to the requirements in 19.15.11.9.D(2) NMAC, submit its H_2S Contingency Plan and obtain approval by the Division's Environmental Bureau of its H_2S Contingency Plan before it commences injection;

i. Agave shall reenter the plugged and abandoned Sims #001 (API 30-025-2695), Government L Com #001 (API 30-025-25604), and Smith Federal #001 (API 30-025-27491) wells, perforate and squeeze cement across the injection zone in each well, and replug the wells in accordance with current Division requirements;

j. Agave shall reenter the plugged and abandoned Government L Com #2 (API 30-025-26369) well, place a balanced cement plug across the injection zone, and replug the well in accordance with current Division requirements;

k. Agave may request relief from the Commission in the event that it encounters problems upon reentering the plugged and abandoned wells or has new data to present to the Commission regarding the wells;

l. Agave shall not inject any produced water; and

m. Agave's injection authority shall automatically terminate 30 years after the date of the Commission's order, and any extension of the injection authority will require an application to and approval by the Commission.

2. Agave's injection authority shall terminate three years after the issuance of the Commission's order if Agave has not commenced injection by that time, and any extension of this deadline requires an application to and approval by the Commission.

3. The injection authority granted is not transferable except upon Division approval. The Division may require the operator to demonstrate mechanical integrity of the well prior to approving transfer of authority to inject.

4. The Commission retains jurisdiction over this case for the entry of such further orders as the Commission deems necessary.

DONE at Santa Fe, New Mexico on the 23rd of January 2012.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

SCOTT DAWSON, Member

ROBERT BALCH, Member

JAMI BAILEY, Chair

SEAL