

**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. 13933
ORDER NO. R-12836**

**APPLICATION OF BURLINGTON
RESOURCES OIL & GAS COMPANY LP FOR
APPROVAL OF A PILOT CO2
SEQUESTRATION INJECTION WELL
PROJECT WITHIN THE BASIN-FRUITLAND
COAL GAS POOL, SAN JUAN COUNTY,
NEW MEXICO.**

ORDER OF THE DIVISION

BY THE DIVISION:

This case came on for hearing at 8:15 a.m. on June 21, 2007, at Santa Fe, New Mexico, before Examiners David K. Brooks and Richard Ezeanyim.

NOW, on this 29th day of October, 2007, the Division Director, having considered the testimony, the record and the recommendations of the Examiners,

FINDS THAT:

- (1) Due notice has been given, and the Division has jurisdiction of the subject matter of this case.
- (2) By this application, Burlington Resources Oil & Gas Company LP ("Applicant") seeks approval of a pilot carbon dioxide (CO2) sequestration injection project, within a project area consisting of all of Section 32, Township 31 North, Range 8 West, NMPM, in San Juan County, New Mexico.
- (3) Applicant proposes to drill and utilize one injection well, to be located 2500 feet from the North line and 2665 feet from the West line (Unit F) of Section 32, for injection of CO2 into the basal coals of the Fruitland formation in the Basin-Fruitland

Coal Gas Pool (71629) through an injection interval at a depth from approximately 3123 feet to 3148 feet below the surface.

(4) Applicant proposes to construct the injection well with 9 5/8" surface casing set at 200 feet and cemented to surface; 7" intermediate casing set at the top of the basal Coal, at approximately 3080 feet and cemented to surface, and a 5 1/2" uncemented liner hung in the intermediate casing. The liner will be perforated at the proposed injection interval. Injection will be accomplished through 2 7/8" J-55 steel tubing, installed in a 7" Model M retrievable packer, set in the intermediate casing at approximately 3040 feet.

(5) The purpose of this pilot project is to investigate the technical and commercial feasibility of disposal of CO₂ by sequestration into coalbeds, and specifically:

(a) to investigate the injectivity rates that can be obtained for CO₂ in the Fruitland Coal formation;

(b) to determine whether, and to what extent, CO₂ injection into the Fruitland Coal will enhance production of natural gas from the formation; and

(c) to assess at the long-term CO₂ storage capabilities of the Fruitland Coal.

(6) At the hearing, Applicant presented engineering testimony and exhibits to the effect that:

(a) Applicant planned this project in cooperation with the Southwest Regional Partnership, a cooperative venture including the Western Governors' Association, five major public utilities, seven major energy companies (including Applicant), three federal agencies, New Mexico Institute of Mining and Technology, and many others.

(b) The purpose of the Southwest Regional Partnership is to investigate the potential for identifying and controlling greenhouse gases, including CO₂. One of the strategies being investigated for that purpose is underground sequestration of CO₂ in oil and gas-bearing strata.

(c) The project will utilize naturally occurring, dry CO₂ produced from the Paradox Basin of Colorado, and shipped through an existing CO₂ pipeline that crosses the San Juan Basin.

(d) The proposed project site was selected because it is in the "Fairway," the most productive part of the Fruitland Coal, is acceptable to offset operators and environmental groups, and is in close proximity to the existing pipeline that will supply the CO₂.

(e) The proposed injection well will be located close to the geographic center of the project. Applicant currently operates three wells that are producing natural gas from the Fruitland Coal within the proposed project area, located in different directions from the proposed injection well, thus establishing an inverted four-spot pattern. Applicant will continue to produce these wells and monitor pressures and production of both natural gas and CO₂ from these wells throughout the term of the project.

(f) The Fruitland Coal zone in this area is approximately 25 to 30 feet in thickness, has been substantially de-watered, has very low bottomhole pressure, and exhibits a permeability range from 10 to 100 millidarcies. All of these characteristics enhance its attractiveness as an injection target.

(g) Applicant proposes a limiting injection pressure at the surface of 1135 psi. Applicant believes that limit is appropriate for implementation of the project so that the CO₂ will remain confined in the injection formation.

(h) Based on Langmuir Gas Desorption curves constructed from data specific to the coals in this area, CO₂ has approximately twice as great a tendency as methane to be adsorbed by the coal. Accordingly, Applicant expects that injection of CO₂ into the coal will cause methane to desorb and be replaced by a greater quantity of adsorbed CO₂, resulting in increased natural gas production and stable emplacement of CO₂ in the formation.

(i) Applicant proposes to continue injection into this pilot project for one year or until it has injected 1.2 BCF of CO₂, whichever first occurs, and then continue monitoring for an additional one year.

(j) Based on a review of the well records for the wells within the one-half mile area of review (AOR), there is adequate cement above and below the injection interval in each of those wells to isolate the injection zone, so that none of those wells could become a conduit for the transmission of injected fluids into other formations, or to the surface.

(k) There are no existing drinking water sources within two miles of the injection well.

(l) A water source well was drilled within the two-mile radius in 1975 into the Ojo Alamo formation, and perforated at depths from 1862 feet to 2034 feet. All water samples from that well tested greater than 10,000 mg/l total dissolved solids. An earlier water source well was drilled in the vicinity and subsequently plugged. However, no samples from that earlier well are available.

(m) Approval of the proposed pilot project will afford Applicant an opportunity to determine the maximum injectivity of the Fruitland Coal and what

reservoir properties will affect that injectivity over time, and make possible an evaluation of the CO₂ sequestration potential of the Fruitland Coal.

(n) Following the conclusion of the project, the Southwest Regional Partnership will prepare a technical report of the results of this project, as well as others it is sponsoring, which will be published.

(7) BP America Production Company and Koch Exploration Company each entered appearances at the hearing through counsel, but did not present evidence or oppose the application. No other party appeared at the hearing or otherwise opposed the application.

The Division concludes that:

(8) The design of the injection well is appropriate and should be approved. The testimony is somewhat unclear about the presence of freshwater. Applicant's witness testified that "the freshwater sources in the area are actually fairly shallow," without identifying the sources to which he referred, or defining "fairly shallow." The only water samples identified were from an oil and gas water source well, and did not indicate the presence of fresh water. However, the plan to set intermediate casing at the top of the injection formation and cement to surface should adequately protect any freshwater sources that may exist.

(9) Division records indicate that one of the producing wells in the AOR, the State Com K Well No. 7A (API No. 30-045-21702), located 990 feet from the South line and 990 feet from the East line (Unit P) of Section 32, has been approved for downhole commingling of production between the Fruitland Coal and the Mesaverde. Prior to commencement of injection, the Mesaverde interval in this well should be sealed off to prevent communication of injected fluids to that formation.

(10) Except as indicated in Finding Paragraph (9) above, all of the wells in the AOR appear to be adequately cased and cemented, so that none of them will become a conduit for the escape of injected fluid from the permitted injection formation. Accordingly no other remedial work on wells in the AOR need be required.

(11) Based on the pressure gradient calculations presented by Applicant, Applicant should be authorized to inject fluids at a surface injection pressure not to exceed 1135 psi; provided that Applicant may apply to the Division for a higher injection pressure upon satisfactorily demonstrating that an increase in injection pressure will not result in fracturing of the injection formation or confining strata.

(12) The proposed project will, in reasonable probability, prevent waste by making possible the production of natural gas that would not otherwise be produced, will contribute to protection of public health and the environment by making available information concerning the viability of the Fruitland Coal as a reservoir for sequestration of anthropogenic CO₂, and will not impair correlative rights.

(13) Accordingly, the application should be approved.

IT IS THEREFORE ORDERED THAT:

(1) Burlington Resources Oil & Gas Company LP ("Burlington" or "Operator") is hereby authorized to institute a pilot CO₂ injection and sequestration project within a project area consisting of all of Section 32, Township 31 North, Range 8 West, NMPM, in San Juan County, New Mexico, for injection of carbon dioxide (CO₂) into the basal coals of the Fruitland Coal formation in the Basin-Fruitland Coal Gas Pool (71629) through an injection interval at a depth from approximately 3080 feet to 3210 feet below the surface.

(2) This project is hereby designated the Burlington/Southwest Regional Partnership CO₂ Sequestration Pilot Project ("the Project"). Burlington is designated operator of the project.

(3) Burlington is authorized to inject CO₂ into the Fruitland Coal formation within the injection interval identified above through a single injection well to be drilled at a location 2500 feet from the North line and 2665 feet from the West line (Unit F) of Section 32.

(4) Prior to commencement of injection, Operator shall enter the State Com K Well No. 7A (API No. 30-045-21702), located 990 feet from the South line and 990 feet from the East line (Unit P) of Section 32, and set a cast iron bridge plug at the base of the Fruitland Coal formation, in order to seal off that formation and prevent the escape of injected fluids therefrom. **The operator shall provide written verification to the engineering bureau in the Santa Fe office of the Division of completion of the foregoing requirement.** After the conclusion of the Project, the bridge plug may be removed, and authorization to downhole commingle production in that well from the Fruitland Coal and Mesverde formations, pursuant to a previous Division administrative order, shall be reinstated.

(5) The operator shall take all steps necessary to ensure that the injected fluid enters only the injection interval and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(6) The injection of CO₂ into the proposed injection well shall be accomplished through 2-7/8 inch, corrosion-resistant steel tubing installed in a packer set in the intermediate casing within 100 feet of the uppermost injection perforations. The casing-tubing annulus shall be filled with an inert fluid, and a gauge or approved leak-detection device shall be attached to the annulus in order to detect leakage in the casing, tubing or packer.

(7) Prior to commencing injection operations, the casing in the injection well shall be pressure tested throughout the interval from the surface down to the packer setting depth to assure the integrity of such casing.

(8) The injection well shall be initially equipped with a pressure control device or acceptable substitute that will limit the surface injection pressure to no more than 1135 psi.

(9) The Division Director shall have the authority to administratively authorize an increase in injection pressure upon a showing by the operator that such higher pressure will not result in fracturing of the injection formation or confining strata.

(10) For each injection well, the operator shall give at least 72 hours advance notice to the supervisor of the Division's Aztec District Office of the date and time (i) injection equipment will be installed, and (ii) the mechanical integrity pressure tests will be conducted, so these operations may be witnessed.

(11) The operator shall provide written notice of the date of commencement of injection into each well to the Aztec District Office of the Division.

(12) The operator shall immediately notify the supervisor of the Division's Aztec District Office of the failure of the tubing, casing or packer in any of the injection wells, or the leakage of water, oil, gas or other fluid from or around any producing or abandoned well within ½ mile of the injection well, and shall take all steps as may be timely and necessary to correct such failure or leakage.

(13) The Project shall be governed by Division Rules No. 701 through 708. The operator shall submit monthly reports of the injection operations on Division Form C-115, in accordance with Division Rules 706 and 1120.

(14) In accordance with Rule 705.C, the injection authority granted herein shall terminate one year after the effective date of this order if the operator has not commenced injection operations; provided, however, the Division, upon written request by the Operator, may grant an extension for good cause.

(15) Operator shall provide written notice to the Division upon permanent cessation of injection into the Project and upon final completion of the Project.

(16) This order does not relieve Operator of responsibility should its operations cause any actual damage or threat of damage to protectible fresh water, human health or the environment; nor does it relieve the operator of responsibility for complying with applicable Division rules or other state, federal or local laws or regulations.

(17) Upon failure of the operator to conduct operations (1) in such manner as will protect fresh water or (2) in a manner consistent with the requirements in this order, the Division may, after notice and hearing, (or without notice and hearing in event of an

emergency, subject to the provisions of NMSA 1978 Section 70-2-23), terminate the injection authority granted herein.

(18) At the conclusion of this project, the operator shall furnish to the Division a technical report of the results of this project.

(19) 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.



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STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

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

MARK E. FESMIRE, P.E.
Director