

**STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
ORDER OF THE SUPERVISOR OF WELLS**

IN THE MATTER OF

THE PETITION OF RIVERSIDE ENERGY)
MICHIGAN, LLC, FOR AN ORDER OF THE)
SUPERVISOR OF WELLS APPROVING AN)
EXPANSION OF ORDER 02-2020 ENHANCED GAS)
RECOVERY OPERATION, BY INJECTION OF)
CARBON DIOXIDE, AND SUCH OTHER)
APPROPRIATE SUBSTANCES AS MAY BE) ORDER NO. 12-2023
APPROVED, INTO THE ANTRIM FORMATION, FOR)
THE CHESTONIA 18 USP PROJECT, IN PARTS OF)
SECTIONS 5, 6, 7, 8, 16, 17 AND 18 IN TOWNSHIP)
30 NORTH, RANGE 6 WEST, (CHESTONIA)
TOWNSHIP) AND SECTIONS 1, 11 AND 12 IN)
TOWNSHIP 30 NORTH, RANGE 7 WEST,)
(KEARNEY TOWNSHIP) ALL IN ANTRIM COUNTY,)
MICHIGAN..)

OPINION AND ORDER

This case involves the Petition of Riverside Energy Michigan, LLC (Petitioner) requesting the approval of an expansion of a previously approved secondary/enhanced recovery operation by injection of carbon dioxide in the Chester/Kearney USP (USP) in order to maximize the recovery of gas pursuant to Section 61506(i), Part 615, Supervisor of Wells, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), and R 324.612 of the rules promulgated pursuant to Part 615. Injection of carbon dioxide was permitted in the Chester/Kearney USP pursuant to Order No. 02-2020. The original USP included the following lands located in Antrim County, Michigan:

Township 30 North, Range 6 West, Chestonia Township

Section 5: SW/4 SW/4

Section 6: S/2

Section 7: Entire

Section 8: W/2, W/2 E/2

Section 17: N/2

Section 18: N/2

Township 30 North, Range 7 West, Kearney Township

Section 1: SE/4, W/2

Section 11: Entire, except W/2 SW/4

Section 12: Entire

The Petitioner applied and was approved to expand the USP to include approximately 1,360 acres located in Antrim County, Michigan and described as:

Township 30 North, Range 6 West, Chestonia Township

Section 5: NW/4 SW/4

Section 16: SW/4 SW/4

Section 17: S/2

Section 18: S/2

Township 30 North, Range 7 West, Kearney Township

Section 13: Entire

The combined legal description of the Original USP and the Expansion Area are referred to as the Chestonia 18 USP and include the following lands in Antrim County, Michigan:

Township 30 North, Range 6 West, Chestonia Township

Section 5: W/2 SW/4

Section 6: S/2

Section 7: Entire

Section 8: W/2, W/2 E/2 Section 17: N/2

Section 16: SW/4 SW/4

Section 17: Entire

Section 18: Entire

Township 30 North, Range 7 West, Kearney Township

Section 1: SE/4, W/2

Section 11: Entire, except W/2 SW/4

Section 12: Entire

Section 13: Entire

The Chestonia 18 USP consists of approximately 5,220 acres.

JURISDICTION

The development of oil and gas in this State is regulated under Part 615, Supervisor of Wells, of the NREPA, MCL 324.61501, *et seq.* The purpose of Part 615 is to ensure the orderly development and production of the oil and gas resources of this State, with a view to the ultimate recovery of the maximum production of these natural resources. MCL 324.61502. To the end of maximizing recovery, the Supervisor of Wells (Supervisor) regulates secondary recovery methods of oil and gas, including the introduction of substances into producing formations, for purposes of enhancing production. MCL 324.61506(i). A person proposing secondary recovery by injection of water, gas, or other fluid into a producing formation must file a petition for public evidentiary hearing. 1996 AACS, R 324.612. The evidentiary hearing is governed by the applicable provisions of the Administrative Procedures Act, 1969 PA 306, as amended, MCL 24.201, *et seq.* See 1996 AACS, R 324.1203. The evidentiary hearing in this matter was scheduled for December 13, 2023.

FINDINGS OF FACT

The Petitioner specifically requests that the Supervisor issue an Order allowing the Petitioner to inject carbon dioxide and other approved substances into the Antrim Formation underlying the Chestonia 18 USP, more specifically identified as all formations lying between the top of the Lachine and the base of the Norwood, for the purpose of enhanced gas recovery.

The Supervisor determined that the Notice of Hearing was properly served and published. No answers to the Notice of Hearing were received. The Supervisor designated the hearing to be an uncontested evidentiary hearing pursuant to R 324.1205(1)(c) and directed evidence be presented in the form of verified statements.

In support of its case, the Petitioner offered the sworn testimony of Philip Koro, engineering, and oilfield consultant for the Petitioner.

I. Unit Area

The spacing of wells targeting the Antrim Formation is governed by Order No. 14-9-94, as amended. This Order allows for wells to be developed on a project basis through Uniform Spacing Plans (USPs) formed by combining blocks of governmental surveyed quarter-quarter sections of land, so long as the underlying leases allow for such pooling. On October 3, 2023, the Petitioner filed a request to expand the previously approved Chestonia/Kearney USP. Mr. Koro testified that the Expanded USP, named the Chestonia 18 USP, is subject to a Unitization Agreement executed or ratified by all owners within the USP and that the Plan of Unitization allocates production to the various tracts on a mineral acre basis (a ratio of the mineral acres owned by a respective party, in proportion to the total number of mineral acres in the unit). The Chestonia 18 USP comprising 5,220 acres was approved administratively by the Oil, Gas, and Minerals Division (OGMD) on October 16, 2023. The proposed injection of carbon dioxide will occur within the Chestonia 18 USP and will initially utilize existing wells.

Mr. Koro's Exhibit A depicts the Chestonia 18 USP and the location of wells in the area. Mr. Koro's verified statement indicates pursuant to Order 02-2020, the Petitioner commenced injection of carbon dioxide in the Chestonia/Kearney USP, with initial injection on February 23, 2022, utilizing the Burnett A3-18 Well. Injection was at the rate of 350 thousand cubic feet per day (Mcf) of carbon dioxide at a pressure of 195 pounds per square inch (psi). Injection continued through December 3, 2022, at which time injection was paused to evaluate the impact of stopping injection. Injection resumed on January 12, 2023, until January 19, 2023, when injection was switched to the Green River D4-7 well. The Petitioner injected 600 Mcf at a pressure of 155 psi until September 4, 2023. After September 4, 2023, the Petitioner has been pulsing injection on an approximately 30-day off, 30-day on cycle to further assess the impact of carbon dioxide injection on the reservoir.

Mr. Koro testified that he monitored production for the Chestonia/Kearney USP during the injection period on a project-level basis and provided Exhibit C, which details the primary production data associated with this project. During the period of injection, actual production (gas delivered) for the Chestonia/Kearney USP increased over the prior

year by 7,303 Mcf and for 2023 is projected to produce 23,000 Mcf above the decline trend.

Mr. Koro testified and provided Exhibit D, indicating that the injected carbon dioxide (plume) was migrating toward the acreage in Sections 13, 17 and 18 which is the subject of the present Petition to expand area for injection. Mr. Koro's opinion was that the producing wells in sections 13, 17, and 18 will experience increased methane production as a result of the carbon dioxide flood if carbon dioxide injection continues in the current injection wells.

To highlight the geology of the area, Mr. Koro submitted Exhibit F which shows two geologic cross sections transecting the USP and depicts the thickness and depths of the Glacial Drift, the Ellsworth Shale, and the Antrim Shale. Exhibit G, submitted by Mr. Koro, is a geologic structure map of the Antrim Shale. Mr. Koro testified that the Antrim Shale has very low structural relief dipping to the south and that structure does not play a significant role in influencing Antrim natural gas production as both structurally low and high areas of the Antrim are productive.

I find the expanded boundary of the Chestonia 18 USP is an appropriate Unit Area for enhanced recovery operations.

II. Secondary Recovery

Mr. Koro states that the Petitioner owns a carbon dioxide processing plant located within the boundary of the USP. He sponsored Exhibit E as a schematic of the wells and infield gathering system. It is Mr. Koro's opinion that in order to maximize the ultimate recovery of methane gas that the Petitioner be permitted to expand the injection of carbon dioxide into the Antrim Formation to an area that corresponds with the Chestonia 18 USP.

Mr. Koro testified that reserve recovery through December 2022 is 8.9 billion cubic feet (Bcf), and based on decline curve analysis, estimates another 2.7 Bcf of remaining primary production. Mr. Koro sponsored Exhibit I to show the estimated ultimate recovery with the Chestonia 18 USP would result in incremental gas recovery of 3,108 million cubic feet (MMcf) to 7,770 MMcf over estimated primary production of 11,544.16 MMcf. Mr. Koro's enhanced gas recovery forecast and estimated economics indicate the project will be profitable and add additional gross revenue of about \$4.754 million assuming lower end estimated ultimate recovery (Exhibit J).

Based on the Petitioner's analysis, there is evidence of a significant amount of methane gas remaining in the reservoir underlying the Chestonia 18 USP that will not be recovered by further primary production but may be recovered by enhanced recovery operations through the injection of carbon dioxide in the reservoir. I find the estimated cost of injection operations will not exceed the value of the additional hydrocarbons recovered. I further find that the injection of carbon dioxide proposed by the Petitioner is feasible, prevents waste, and presents a reasonable opportunity to recover gas from the Chestonia 18 USP which will not be recovered by conventional primary production techniques.

CONCLUSIONS OF LAW

Based on the findings of fact, I conclude, as a matter of law:

1. The Supervisor may regulate the secondary recovery methods of oil and gas, including the introduction of gas, air, water, and other substances into the producing formations. MCL 324.61506(i).

2. A person desiring to inject water, gas, or other fluid into a producing formation or use other technology for the purpose of increasing the ultimate recovery of hydrocarbons from a reservoir shall file a petition for hearing. 1996 AACRS, R 324.612(1).

3. The operator of a secondary recovery project shall keep accurate records of all oil, gas, and brine produced; volumes of fluids injected; and injection pressures. The operator shall file reports of the data, and other data as may be required, with the Supervisor at regular intervals, as specified. 1996 AACRS, R 324.612(2).

4. The Supervisor has jurisdiction over the subject matter and the persons interested therein.

5. Due notice of time, place, and purpose of the hearing was given as required by law, and all interested persons were afforded an opportunity to be heard, with respect to the determination made herein. 2015 AACRS, R 324.1204.

DETERMINATION AND ORDER

Based on the Findings of Fact and Conclusions of Law, the Supervisor of Wells determines that the secondary recovery operations will prevent waste and will maximize the recovery of hydrocarbons from the unitized formations within the Unit Area.

NOW, THEREFORE, IT IS ORDERED:

1. The Petition of Riverside Energy Michigan, LLC, is granted, and the proposed Unit Area (Chestonia 18 USP) is approved in accordance with and subject to this Order.

2. Riverside Energy Michigan, LLC, is appointed the Unit Operator.

3. The Unitized Formation is described as:

Antrim Formation more specifically identified as all formations lying between the top of the Lachine and the base of the Norwood.

4. Riverside Energy Michigan, LLC, shall make reports to the Supervisor; and when requested, meet with Supervisor's staff to review, and evaluate the current data. Specifically, Riverside Energy Michigan, LLC, shall report to or consult with the Supervisor's staff as follows:

a. The existing Engineering Committee established under Order 02-2020, consisting of representatives of Riverside Energy Michigan, LLC, and representatives of the Department of Environment, Great Lakes, and Energy (EGLE), Oil, Gas, and Minerals Division (OGMD), shall continue to provide oversight of the enhanced gas recovery project for the Chestonia 18 USP Unit Area.

b. The Engineering Committee shall meet from time to time as the Supervisor's representatives shall determine.

c. Riverside Energy Michigan, LLC shall continue to monitor the freshwater aquifer, reservoir pressures, and carbon dioxide concentrations and migration within the Chestonia 18 USP area. The existing monitoring plan established under Order 02-2020 remains in effect and subject to revision as determined by the Supervisor.

5. Riverside Energy Michigan, LLC shall notify the Supervisor between 30 and 60 days prior to the commencement of injection operations, and between 30 and 60 days prior to the anticipated date of permanent cessation of injection operations. The Petitioner shall comply with the filing requirements of R 324.610, R 324.612, and R 324.810 of the administrative rules of Part 615 of the NREPA and shall obtain such approvals as are necessary from the Department of Environment, Great Lakes, and Energy (EGLE).

6. Operation of the Chestonia 18 USP Unit Area shall be conducted exclusive of and as an exception to all applicable spacing orders and rules, provided that the well

density is no less than 80-acres per well, the distance between bottom hole locations of wells is no less than 1,320 feet, and that no well may be completed in the Unitized Formation at a location closer than 330 feet from the outside boundaries the USP.

7. The enhanced recovery operations shall initially be accomplished by the injection of carbon dioxide. Other substances may only be injected with written approval from the Supervisor.

8. The Supervisor retains continuing jurisdiction over the Unit Area in order that the Supervisor may exercise such administrative control as is consistent with the powers and duties of the Supervisor, as established by Part 615 of the NREPA.

9. This Order is effective immediately.



Dated: February 22, 2024

Adam W. Wygant
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