Lucid Energy Delaware, LLC
Red Hills Gas Plant – Subpart RR Annual report
Reporting Year 12/21/2021 – 12/31/2021

Annual Report: 40 C.F.R. 98.446 (Subpart RR)

Company Name:	Lucid Energy Delaware, LLC
Company Address:	201 S 4TH St Artesia, NM, 88210
GHGRP ID:	553798
Facility Name:	Red Hills Gas Plant
Facility Address:	1934 W Nm Highway 128, Jal NM, 88252
Reporting Period:	12/21/2021 – 12/31/2021
Submittal Date:	03/31/2022

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Certification by Designated Representative: Jaylen Fuentes

"I am authorized to make this submission on behalf of the owners and operators of the facility or supplier, as applicable, for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment."

Executive Summary:

Lucid Energy Delaware, LLC (Lucid) initiated monitoring protocols according to the Red Hills AGI #1 and AGI #2 Monitoring, Reporting, and Verification (MRV) Plan on December 21, 2021 which continued through December 31, 2021 of the reported year. The final MRV plan was approved by the EPA on December 21, 2021 and is identified by number 1011064-1. Data collection for the total mass of CO_2 sequestered also began on December 21, 2021.

Summary Table of Monitoring Activities:

Below find a table which specifies potential leakage pathways according to MRV plan 1011064-1 for reporting year 2021. The table contains each possible pathway, detection protocol, and the Red Hills Gas Plant response plan.

Leakage Pathway	Detection Monitoring	Response Plan
Surface Equipment	• Distributed control system (DCS) surveillance • Visual inspections, Inline inspections • Fixed in-field gas monitors/CO_2 monitoring network • Personal and hand-held H_2S monitors	• Immediate response • Quantify leaks according to the requirements of 98.448 (d)
New Other Wells	• Monitoring of fluid returns during drilling • Multiple gas monitoring points around drilling • Personal and hand-held H_2S monitors	• Immediate response • Blowout preventers
Red Hills AGI Well	• DCS surveillance of well operating parameters • Visual inspections • Mechanical integrity tests (MIT) • Fixed in-field gas monitors/CO_2 monitoring network • Personal and hand-held H_2S monitors • In-well P/T sensors	• Immediate response
Existing Other Wells	• Monitoring of well operating parameters • Visual inspections • MITs	• Immediate response
Fractures/Faults	• DCS surveillance of well operating parameters • Fixed in-field gas monitors/CO_2 monitoring network • Personal and hand-held H_2S monitors	• Keep pressures below parting pressure • Shut in injectors near faults
Confining Zone/Seal	• DCS surveillance of well operating parameters • Fixed in-field gas monitors/CO_2 monitoring network	• Shut in injectors
Seismicity	• DCS surveillance of well operating parameters • Seismic monitoring	• Shut in injectors near seismic event
Lateral Migration	• DCS surveillance of well operating parameters • Fixed in-field gas monitors/CO2 monitoring network	• Shut in injectors

Table 1. Potential leakage pathways, detection methods, and the accompanying response plan

Narrative History of the Lucid Energy Delaware, LLC Monitoring Plan:

Subpart RR at 40 CFR 448(a)(3) requires a strategy for detecting and quantifying surface leakage of CO_2.
Lucid will employ the strategy noted in section 2 for detecting, verifying, and quantifying CO_2 leakage to the surface through each potential pathway. Lucid considers H_2S to be a proxy for CO_2 leakage to the surface and as such has employed and expanded upon methodologies detailed in their H_2S Contingency plan to detect, verify, and quantify CO_2 surface leakage. Monitoring will occur for the duration of injection and the 5-year post-injection period with two objectives:

1. to detect anomalies prior to any surface leakage, and
2. to quantify any leaks which occur.

To implement this plan, Lucid collected pressure, temperature, and flow characteristics at the Red Hills Gas Plant. These metrics were monitored hourly by computer software and flagged if outside a previously established threshold for safe practices. Notifications were sent directly to operations members if any anomalies occurred and reports were reviewed daily. Furthermore, the Red Hills Gas Plant and existing RH AGI #1 well are manned and monitored 24-hours-a-day, 7-days a week for any leaks.

Thermal mass volumetric flow meters are used to measure volumes of CO_2 received and injected. Fluid samples are taken at the inlet to the compressor and gas fractional analysis is performed in a laboratory to determine CO_2 concentration. CO_2 volume and concentration was then used to determine the mass of CO_2 received and injected according to the equations found in 40 CFR 98.443.

Lucid consulted 40 C.F.R. Part 98, Subpart W to inform potential avenues for leaks from equipment located on the surface between the volumetric flow meter measuring injection quantity and the AGI #1 wellhead. Avenues of consideration are: valves, connectors, open ended lines, pressure relief valves, and meters. Any mass of CO_2 lost from surface equipment leakage is parameter CO_{2FI} used in equation RR-12. The mass of CO_2 lost from all other surface leakage pathways listed in Table 1 are combined as parameter CO_{2E} in equation RR-12. There is no gas venting at the Red Hills Gas Plant.

Non-Material Changes to EPA-Approved MRV Plan:

Lucid has no non-material changes to report to the EPA-approved MRV Plan for the reporting year of 2021.

Narrative History of Monitoring Anomalies Found:

Lucid monitored CO_2 injection from Red Hills well AGI #1 to identify potential anomalies which may indicate subsurface leakage. For the 2021 reporting period, there was no surface leakage and no anomalies observed.

Description of Surface Leakage:

Red Hills Gas Plant is manned 24 hours a day, 7 days a week. During this time workers routinely checked for leakage through numerous avenues: visual inspections of equipment, analyzation of pressure, temperature, and flow data, groundwater monitoring, wellhead mechanical integrity tests, and seismic monitors. Smaller leaks were constrained through the implementation of handheld H_2S monitors on all personnel and across the grounds which activate if a concentration greater than 5ppm is detected. 33 Li-COR CO_2 flux collars were also installed from which a soil baseline was established. Any large, consistent changes above this baseline should be investigated and they could indicate that a leak may have occurred.

For the 2021 reporting year there were no equipment leaks found and there was no surface leakage from the subsurface at the Red Hills facility.