

Date: January 8, 2013

Mike Hawks
Project Development Manager, Clean Energy Wyoming
Linc Energy,
159 North Wolcott Street, Suite 250
Casper WY 82601
United States

RE: Proposed Discussion Items for January 10, 2013 Meeting, Linc Energy Underground Coal Gasification (UCG) Research and Development (R&D) License Application, TFN 5 5/128.

Dear Mr. Hawks:

The Land Quality Division (LQD) and Lidstone & Associates (LA) understand that Linc Energy has requested flexibility to the burn cavity dimensions, hence water treatment volumes in the R&D application. This flexibility should account for the R&D nature of the project and its inherent operational uncertainties in controlling the size of the cavities. In the third round response submittal received on December 21, 2012, Linc has proposed to double the mass of the coal consumed from the initial 1,008 tons to 2,020 tons of coal. The increase in mass of coal would result in an increase in burn cavity size and an increase in the volume of treated water. The revised bond includes water treatment costs for 2,000,000 gallons of water versus the previous bond estimate of 886,000 gallons of water. Considering these revisions, Linc has proposed a reclamation cost estimate of \$2,605,148.88 in Addendum 1-A of the Adjudication File of their proposed UCG Demonstration, Gasifier 6 Project, R&D License Application (Linc Application, Third Round Response Submittal, December 21, 2012). The reclamation cost estimate will be addressed at our meeting on January 10, 2013.

Linc has also requested the flexibility in the injection flow rate from 750 Nm³/hour to no more than 1500 Nm³/hour. In addition, Linc has proposed two additional items (1) an increase in the R&D demonstration project time period from 90 to 120 days and (2) doubling the number of burn cavities. The LQD/LA reviewers will be providing the review comments to Linc on January 21, 2013. In order to facilitate the review process the LQD, LA and Linc have scheduled a meeting in Cheyenne on January 10, 2013. This memo is intended to provide Linc with a draft discussion agenda and preliminary thoughts from the LQD/LA as discussion points. Please note that these cannot be construed as final response to Linc's third round submittal as the LQD/LA might revisit and revise these initial comments after the meeting on January 10, 2013.

Discussion Items and Preliminary Third Round Response Comments:

1. Flexibility with the burn cavity dimensions
 - a. Linc update the R&D license document to reflect their proposed plans to allow a larger burn cavity dimension and monitoring commitment.
 - b. Ensure in the text that the flexibility in burn cavity dimensions presented is a worst case scenario and Linc does not intend to pursue this as a design goal and it is a just-in-case measure.
 - c. Please note that if Linc exceeds the proposed flexibility in burn cavity dimensions, volume of burn cavity or the mass of coal burnt then the LQD will consider that as an enforceable violation.
2. Increasing the time period from 90 to 120 days
 - a. Please provide a justification in the text for the requested increase in the number of days.
 - b. Linc update the R&D license document to reflect the greater time period. Again if the R&D goal is 90 days and 120 days is a just-in-case measure, it should be so stated.
3. Doubling the number of cavities
 - a. Linc has not provided details about the location of these cavities or the justification for this requested flexibility.
 - b. Based on the limited information presented, there are concerns about the adequacy of the monitoring network and aquifer exemption boundary.
 - c. The LQD/LA considers this a significant change to the permit application and if Linc wishes to proceed with flexibility for additional cavities, LQD will likely request more detail and expansion of the monitoring network.
4. Inform Office of State Lands and Investments (OSLI) that the Linc proposed R&D may result in an increase in the amount of consumed coal. It is our understanding that OSLI has agreed to no royalty payment by Linc during the R&D, but they likely understand that this no royalty agreement applies to 1008 tons of coal.
5. All 50 proposed wells be drilled and sampled prior to ignition. The analysis results shall be provided to LQD prior to ignition.
6. Discussion on the number of the time domain reflectometry (TDR) and thermistor (thermocouple) strings to allow more accurate monitoring of the cavity. Linc may propose an alternative means for monitoring cavity growth. The recent round of comments contained a discussion of utilizing a horizontal TDR string in the cavity to monitor the cavity growth. LQD would be interested in the specifics regarding using the horizontal string. In addition, Linc has discussed the installation of dedicated thermocouple monitoring wells in the coal seam, but the locations of such wells are not clearly defined.
7. Post burn 2D and 3D seismic to define cavity dimensions.

8. Analytical costs during treatment: 2,000,000 gallons of water versus the previous bond estimate of 886,000 gallons of water.
9. Site coordination during the R&D (90-120 day period).
 - a. Monitoring and reporting frequency
 - b. Inspection frequency
 - c. Reporting format
 - i. Linc experience from Australian operations
10. See Attachment A for a discussion on field monitoring guidance that would allow the State to review the adequacy of the bond on a real time basis
 - a. Discussion on the accuracy of mass balance estimation using field data

If you have questions, please contact Muthu Kuchanur by phone at (307) 777-7132 or by email at muthu.kuchanur@wyo.gov.

Sincerely,

Muthu Kuchanur
Permit Coordinator
Land Quality Division

cc: File (TFN 5 5/128)
District 3 - Mark Rogaczewski
Lidstone & Associates - Chris Lidstone

ATTACHMENT A

The following items can be monitored to determine if the Linc R&D is proceeding as predicted.

Process Monitoring

The burn cavity volume should be fairly accurately predicted by the injection and production flow rates. The chemical models accurately predict the production of gas relative to the total volume of coal resource consumed. Previous research shows pretty good agreement between cavity burn models and the actual burned cavity. Linc has proposed rigorous monitoring of the burn production gases and, if done correctly, this will provide a good indication of the burn cavity volume. However this will not give a specific indication of the burn cavity dimensions or location. LQD should be able to tell that issues are arising with the research and development burn, if the gas production exceeds the anticipated production.

Monitoring of the Cavity

Linc is proposing TDR and thermistor strings for monitoring the burn cavity. These devices can be used effectively to monitor the cavity dimensions and location. However, the number of strings that Linc has proposed will not be sufficient to determine the cavity size and location with a high degree of accuracy. This item was discussed in review comment 161 and Linc provided their justifications as to why a higher degree of monitoring was not proposed. To know the cavity location and dimensions with a high degree of accuracy, there is a need for a well-spaced grid of TDR holes across each gasifier to be able to monitor the cavity growth. Linc has only committed to two (2) TDR strings (two boreholes) and this spacing will not provide cavity location and dimensions with a high degree of accuracy. Additional TDR strings will be required to monitor the first cavity and subsequent cavities. Should additional TDR strings be employed the State would be able to tell that issues are arising with the research and development burn, if the cavity locations and dimensions that are monitored are outside of the predicted cavity locations.

Given the Linc plan to increase cavity dimensions (which may include taking more more roof coal), these TDR strings will become even more important in addressing subsidence and Linc may need more TDR strings and a different configuration and emplacement than proposed.

Geotechnical Monitoring

Geotechnical monitoring are proposed using surface settlement devices and TDR as well as subsidence monitoring wells. The State would be able to tell that issues are arising

with the research and development burn if surface subsidence occurs or monitoring data suggest any movement above that which is predicted. Surface subsidence would not be expected to be detected until a significant time after the burn of the cavity, though sudden changes in pressures or over burning of the cavity may be good indicators that things may not be going as planned. If additional TDR strings are employed, Linc and the State may have the ability to detect subsidence and monitor the cavity growth as it occurs.

Hydrogeologic Monitoring

Each (37) monitoring well (trend and excursion wells) will be equipped with transducer, temperature probe and conductivity probe. During the course of the burn (90-120 days) data will be collected from these probes continuously (30 minute increments) and should be made available for DEQ review. If there are sudden changes in monitored parameters, such information may suggest abnormal operating conditions. The data from these wells may necessitate further or more detailed investigation (additional post-burn drilling or changes in air injection parameters during operations).

With respect to ground water clean-up, Linc is proposing to sample and analyze water quality constituents after each burn cavity is removed and transported to Gillette. Should baseline not be achieved after three burn cavity volumes, Linc has committed to review and potentially commit to air sparging techniques for further clean up. Should baseline not be achieved after three burn cavity volumes have been treated and removed, the State would consider a review of the reclamation bond. In general contaminants in the ground water or surface subsidence would not be expected to be detected until a significant time after the burn of the cavity. Essentially ground water inflow will be towards the cavity until the stability period of monitoring, which may be two years after the burn commenced. Current bonding addresses six cavity volumes or 2,000,000 gallons of water to be treated.

