

May 19, 2017

Ms. Xuping Li  
Air Resources Engineer  
Emerging Technology Section  
California Air Resources Board  
1001 I Street  
Sacramento, CA 95814

Dear Ms. Li:

Subject: Air Resources Board (ARB) Carbon Capture and Sequestration (CCS) Program Concept Paper

Thank you for allowing the Energy & Environmental Research Center (EERC) to participate in the May 8 Public Workshop on ARB's CCS Program. We greatly appreciated the opportunity to provide feedback on ARB's efforts to incorporate CCS into the Low Carbon Fuel Standard (LCFS) Program. The following list details the requested technical comments, questions, and concerns regarding the concept paper based on our expertise and experiences in commercial-scale CCS implementation:

#### Associated Storage

- It should be noted that it is unlikely that an oilfield operator will redrill/permit a Class VI well for enhanced oil recovery (EOR) instead of using existing Class II wells.

*“CO<sub>2</sub>-EOR projects with U.S. EPA UIC Class II permits would not be considered to meet the permanence protocol on that merit alone. Staff analysis indicates that additional stringency beyond UIC Class II requirements is needed to ensure permanence of CO<sub>2</sub> sequestration from CO<sub>2</sub>-EOR projects.”*

- In a life cycle analysis (LCA), the chain of emissions related to an original point source is not necessarily located within a localized physical proximity, e.g., oil that is a product of EOR is transported to a refinery, then the products are transported to where they are used and any emissions associated with such are included.

*“Under the LCFS, staff plans to draw a system boundary that includes the substantial sources of emissions for CCS projects, essentially capture, compression, transport, and injection of CO<sub>2</sub>. Staff is considering a project system boundary that begins with generation and capture of CO<sub>2</sub>. Emissions upstream of CO<sub>2</sub> generation would be assigned to the primary product causing those emissions. The project system boundary would end with injection operations. In the case of CO<sub>2</sub> enhanced oil recovery (CO<sub>2</sub>-EOR) emissions associated with oil production would be considered part of the system boundary and be included in the accounting, for example by allocating in some proportion between oil production and CO<sub>2</sub> capture. However combustion would not be included, since oil is a primary product and its combustion emissions would be accounted for separately to the extent it is used in California.”*

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- Why would transferred CO<sub>2</sub> be construed as emitted if it is still stored underground somewhere else?

*“CO<sub>2</sub> that is recovered from produced oil and re-injected, transferred to another field, or emitted will be accounted for in the QM. Our current thinking is that CO<sub>2</sub> transferred to another field would be considered emitted.”*

- It may not be necessary to have different accounting standards for CO<sub>2</sub> EOR and depleted oil and gas reservoirs if the LCA has a system boundary that includes all emissions associated with the entire process.

*“Because injection operations are different between CO<sub>2</sub>-EOR, depleted oil and gas reservoirs, and dedicated saline reservoirs, it may be necessary to account for those operations differently.”*

- Imposing potential economic restrictions in another state may be difficult. Mineral leases dominate pore space leases in states where both lease types exist. When oil prices have climbed to sufficient levels, abandoned oil fields may become viable again. If CO<sub>2</sub> is produced during a revitalization effort, that CO<sub>2</sub> will be accounted for in the same manner as CO<sub>2</sub> produced through a pressure management well.

*“For depleted oil and gas reservoirs, care will need to be taken in their treatment in case these fields could be put back into production. Therefore, there may be requirements specific to accounting for depleted oil and gas reservoirs to ensure these fields will not be put back into production.”*

- Please elaborate on the permanence protocol provision difference between using CO<sub>2</sub> EOR as the sequestration reservoir vs. injecting into depleted oil and gas reservoirs.

*“Similar to the QM concept, the permanence protocol would include different provisions based on whether the project is utilizing CO<sub>2</sub>-EOR as the sequestration reservoir versus injecting into depleted oil and gas reservoirs or saline reservoirs. Again, a risk-based site analysis as well as most post-injection requirements for depleted oil and gas reservoirs or saline reservoirs would likely be similar.”*

- It should be noted that there could be a loss of integrity with any class of well, i.e., the focus should be ensuring well integrity, not necessarily dictating well class.

*“Additionally there is evidence that there has been loss of well integrity for some Class II wells.”*

- Precluding reentry into an oil field that was used to store CO<sub>2</sub> disincentivizes participation in ARB’s program. If production were to occur in the future, any CO<sub>2</sub> recovered could be accounted for and reinjected.

*“In addition, depleted oil and gas reservoirs would not be able to be put back into production; and CO<sub>2</sub>-EOR fields would not be able to be put back into production post-closure.”*

#### **Other Comments**

- From the ARB perspective, are CO and VOCs considered GHGs?

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*“Covered GHGs under the LCFS include CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, CO, and VOCs; again, only CO<sub>2</sub> will be considered for adjusted CI or credit.”*

- Please elaborate on why is ARB not considering reductions in CH<sub>4</sub> and N<sub>2</sub>O.

*“Covered GHGs under the Cap-and-Trade Program include CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O, but only CO<sub>2</sub> will be considered for deduction from a compliance obligation.”*

We look forward to working with you further as the California LCFS Program continues to develop pathways that include CCS. Please contact me with any questions at (701) 777-5355 or [cgorecki@undeerc.org](mailto:cgorecki@undeerc.org).

Sincerely,



Charles D. Gorecki  
Director of Subsurface R&D

CDG/krh

Attachments