

December 5, 2017

By Electronic Transmission
Mr. Samuel Wade
Chief, Transportation Fuels Branch
Industrial Strategies Division
California Air Resources Board
1001 I Street
P.O. Box 2815
Sacramento, CA 95812

Dear Mr. Wade,

Occidental Petroleum Corporation (Occidental) appreciates the opportunity to provide comments on the latest draft of the ARB's "Accounting and Permanence Protocol for Carbon Capture and Geologic Sequestration under the Low Carbon Fuel Standard."

Occidental is a leading international oil and gas exploration and production company, with approximately 33,000 employees and contractors and reported net sales of \$10 billion in 2016. Occidental is also a world leader in enhanced oil recovery (EOR) using carbon dioxide (CO₂). Occidental has more than 40 years of experience with safe and effective injection of CO₂ for EOR and currently injects approximately 47 million metric tons of CO₂ per year in the Permian Basin of West Texas and New Mexico, making it the largest consumer of CO₂ for EOR purposes.

Occidental is pleased with much of the current draft Accounting and Permanence Protocol, while also acknowledging that there are some issues that cause the company concern. These issues include: (1) the ARB's decision to require a 100-year post-injection site care regime; (2) the use of third-party verifiers; and (3) the narrow definition that ARB has proposed for innovative crude oil using CCS.

Requirement for a 100-year post-injection site care regime

From the last version of the regulation provided by ARB, "after injection is complete, the GCS Project Operator must continue to conduct monitoring as specified in ... the Executive Officer-approved Post-Injection Site Care and Site Closure Plan for a *minimum* of 100 years."¹ In addition, the post-injection site care regime requires companies to "conduct leak detection checks at each well that is part of the GCS project and in the near-surface close to each well, annually for 100 years after injection is complete."²

¹ California Air Resources Board (ARB), "Accounting and Permanence Protocol for Carbon Capture and Geologic Sequestration under the Low Carbon Fuel Standard," p. 95.

² ARB, p. 96.

Occidental understands that some level of post-injection site care is necessary after injection ceases, but we have found no reasonable basis to require additional monitoring for 100 years or more. Instead, we suggest that an approach similar to what is in the Oxy, EPA approved, Monitoring, Reporting and Verification (MRV) Plan for Denver Unit be adopted:

Oxy will submit a request for discontinuation of reporting when Oxy can provide a demonstration that current modeling and model(s) show that the cumulative mass of CO₂ reported as sequestered during the Specified Period is not expected to migrate in the future in a manner likely to result in surface leakage. It is expected that it will be possible to make this demonstration within 2—3 years after injection for the Specified Period ceases, and will be based on predictive monitoring supported by monitoring data. The demonstration will rely on two principles: 1) that just as in the case for the monitoring plan, the continued process of fluid management during the years of CO₂ EOR operation after the Specified Period will contain injected fluids in the Denver Unit, and 2) that the cumulative mass reported as sequestered during the Specified Period is a small fraction of the total CO₂ that will be stored in the Denver Unit over the lifetime of operations.³

It is our view that continued use of monitoring wells beyond a reasonable time horizon (10 years or more) increases the risk of CO₂ leakage. In addition to the length of the monitoring period, ARB has also prescribed the use of specific technologies and techniques over extended time spans. In Occidental's experience, the most effective techniques and technologies for monitoring the CO₂ plume and surface conditions are site-specific and will evolve over time. Post-closure monitoring should therefore allow EOR operators to establish specific criteria to demonstrate compliance with the CCS Protocol, but should not require specific technologies and techniques.

If ARB requires a period of 100 years or more of post-injection site care, it is unlikely that Occidental or other operators of EOR and CCS facilities would be willing to participate in this program.

Use of Third-Party Verifiers

Based on four decades of operating experience, Occidental understands how to operate well-managed and economically successful EOR floods. In fact, we are concerned that third-party verifiers will not have experience that is comparable or better than EOR operators such as Occidental. As noted above, in recent years Occidental has developed two MRV plans under Subpart RR of the GHGRP, neither of

³ Oxy Denver Unit CO₂ Subpart RR Monitoring, Reporting and Verification (MRV) Plan, Final Version, December 2015, p. 33. The full Denver Unit MRV Plan is found at this link: https://www.epa.gov/sites/production/files/2015-12/documents/denver_unit_mrv_plan.pdf,

which required third-party verification, and both plans were approved by the U.S. EPA. Thus, it is our view that, at least in the EOR context, companies should be allowed to develop and submit MRV plans, Site-Based Risk Assessment plans, and Emergency Remedial Response Plans.

Occidental also believes that all of the general information requirements listed in Section 1.1.2 (a) – General Requirements – could be provided without the need for third-party verifiers. In fact, every item in section 1.1.2 (a) is available to the company. Similarly, under Section 1.1.2 (b)(1), third-party verifiers are retained to certify three items: (1) that submitted data are true, accurate and complete; (2) that submitted plans are sufficiently robust, such that in their professional judgment, the GCS project is able to meet the permanence requirements for carbon sequestration; and (3) that the Site-Based Risk Assessment is accurate and complete, and that the risks identified are either sufficiently monitored or sufficiently remediated in the Emergency and Remedial Response Plan.

Occidental notes that Section 2.2 (Risk Assessment) describes the tasks that the GCS Project Operator must complete, specifically the development of a Site-Based Risk Assessment and the Emergency and Remedial Response Plan. It is clear that Occidental understands how to develop EOR floods and has significant experience in the development and maintenance of MRV plans, having developed two such plans approved by the U.S. EPA. Thus, Occidental's view is that EOR companies should be able to perform the tasks that might be assigned to third-party verifiers. In EOR fields, everything hinges on choosing the right site, and if that is done properly, there is no need to hire third-party verifiers. Unless the GCS Project Operator is unable to provide required information and data, these tasks need not be performed by third-party verifiers.

Innovative Crude Oil from CCS

While the CCS Protocol and ARB's recent "Preliminary Draft of Potential Regulatory Amendments to the Low Carbon Fuel Standard" recognize crude oil produced from EOR with CCS as a form of innovative crude oil, the drafts appear to define this category narrowly and do not specify details on accounting for innovative crude produced outside of California. Occidental proposes that this category of innovative crude oil should be defined more broadly. In addition, Occidental requests that ARB lay out guidelines on how innovative crude oil produced in another U.S. state would be accounted for when it is delivered to California. The guidelines should also establish how to account for refined low carbon intensity (CI) fuel delivered into California for in-state consumption. We propose the following principles be considered when developing these guidelines:

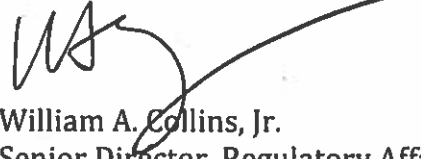
- Most of the existing, large scale CCS projects in North America have been paired with EOR because of both the value that these projects can bring for CO₂ and the dependability that they can offer in taking delivery of CO₂ for an extended period. In addition, EOR operators are best-suited to develop the processes

needed to comply with the CCS Protocol. However, very few of these EOR projects can access CO₂ on site. In order to accelerate deployment of CCS and development of 2nd generation capture technologies, ARB should expand the definition of innovative crude to include EOR crude production using any anthropogenic source of CO₂, provided that these projects do not claim any additional credits for carbon reduction in California. EOR projects can potentially source CO₂ from direct air capture, as well as CCS at power plants and industrial facilities. If ARB elects to limit CO₂ sourcing to on-site projects, we recommend that this definition should include direct air capture projects that are located on site.

- The vast majority of EOR production in the United States occurs outside of California. Accordingly, it is appropriate for ARB to establish accounting guidelines for transporting innovative crude oil and low CI fuels into California. Innovative crude that is produced out of state and transported or sold into CA should be eligible for low CI credits, whether delivered directly to CA or through product exchanges. In the case of direct delivery, innovative crude accounting should allow producers to withdraw the same quantity of low CI crude from a ship or pipeline that they deliver into the same ship or pipeline. Product exchanges, which are commonly used in most commodity industries to simplify logistics, should follow a similar approach. Allowing product exchanges for delivery into California offers a substantial environmental benefit in that it would allow producers of crude oil and transportation fuels to minimize the distance that products are transported, and thus minimize the emissions associated with delivering the products into California.
- Transportation fuels that are produced from low CI crude oil outside of California and sold for consumption in CA should be treated as low CI fuels. The guidance for calculating the CI in this scenario should be laid out in the Accounting and Permanence Protocol.
- Oxy believes it to be essential that the systems for awarding LCFS credits and delivering low CI crude oil and transportation fuels into California are transparent and establish a high level of integrity on the part of participants. We believe that each of the modifications proposed above can enhance the potential and efficiency of the LCFS while upholding each of these principles.

Thank you for the opportunity to review and comment on the "Accounting and Permanence Protocol for Carbon Capture and Geologic Sequestration under the Low Carbon Fuel Standard." If you have questions or would like further data or information from Occidental, please do not hesitate to contact me at (202)-857-3000, or by e-mail at al_collins@oxy.com.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "WAC", with a long, sweeping horizontal line extending to the right across the signature.

William A. Collins, Jr.
Senior Director, Regulatory Affairs
Occidental Petroleum Corporation