April 20, 2018

Transmitted electronically to the Air Resources Board Comment Log:
http://www.arb.ca.gov/lispub/comm/bclist.php

Re: Proposed Amendments to the Low Carbon Fuel Standard Regulation

Thank you for the opportunity to comment on upcoming regulatory action for California's Low Carbon Fuel Standard. California Resources Corporation (CRC) is the largest oil and natural gas exploration and production company in California on a gross-operated basis. The Company operates its world class resource base exclusively within the State of California, applying integrated infrastructure to gather, process and market its production. Using advanced technology, California Resources Corporation focuses on safely and responsibly supplying affordable energy for California by Californians.

CRC explores for, develops and produces oil, condensate, natural gas liquids (NGLs) and natural gas in 135 fields in each of California's four major oil and gas basins (San Joaquin, Los Angeles, Ventura and Sacramento) and, with our joint venture partners, also a net supplier of electricity. All of our workers, properties, facilities and investments are located in California and we are headquartered in Los Angeles. We believe we are the largest private oil and natural gas acreage holder in California, with interests in approximately 2.3 million net mineral acres. We are also the largest producer on State Lands, where we have generated over $585 million in oil and gas revenues for the state over the past four years alone. As a California company, CRC is committed to reducing the state's chronic dependence on imported energy by growing our local energy production in a manner that achieves California's world-leading safety, labor, human rights and environmental standards.

CRC proudly shares and endorses California's commitment to conserve our natural resources and protect our environment, while promoting a vibrant, inclusive future for all our state's diverse communities. We believe that Californians benefit by meeting our energy needs from oil, natural gas and electricity production here at home and retaining the value chain derived from that production, including increased employment, income capital investments, local purchasing and mineral rights, technology development, infrastructure improvements and significant public revenues. As the largest oil and natural gas operator in California, CRC is vested in the success of California's greenhouse gas reduction goal. CRC seeks to take a leading role in employing innovative technologies to reduce carbon intensity (CI) in our operations. CRC's comments on the proposed rulemaking are along two lines: 1) expanding the definition of innovative crude and 2) expanding the Carbon Capture and Sequestration (CCS) Protocol to facilitate the timely development of these projects that are necessarily to achieve both the State's and CRC's sustainability goals.

Innovative Crude Definition

CRC is developing several project applications to employ power generation technologies under the innovative crude oil production provisions of California's Low Carbon Fuel Standard (LCFS). However, we find the definition of innovation as allowed under the current LCFS regulations limiting such that there are opportunities left unexplored.

The current regulation allows the following innovations: 1) Solar Photovoltaic, 2) Solar Thermal, 3) Wind and, 4) Carbon Sequestration. While these are useful technologies to lower the CI of crude produced in California, the list is limited and excludes several other promising routes to accomplish California's goal of reducing CI of its transportation fuels. These other routes could include geothermal energy, biogas, ocean wave energy, or some other innovative energy source or efficiency not considered under the current regulation.

CRC suggests that the existing language be broadened to include other innovative pathways such as those pathways enumerated above. CRC suggests that in addition to the existing language pertaining to CI reductions, the following language be added to §95489:

(d)(1)(A)(5) Geothermal energy,
(d)(1)(A)(6) Biogas,
(d)(1)(A)(7) Ocean wave energy, or
(d)(1)(A)(8) Other technologies or methods as approved by the Executive Officer.

The addition of this language allows the Board flexibility and discretion to use other CI reduction methods to meet California's LCFS goals. These changes will also allow California to meet directives outlined in other State laws such as the recently passed SB 1383, by providing a ready off take for economical projects outside existing power generation or natural gas vehicle markets.

CRC is committed to innovative production through construction and maintenance of integrated local energy production facilities with a highly-qualified California workforce through its project labor agreements with California's unions. We have a state-wide Project Labor Agreement with the California Building and Construction Trades Council and its 300 unions with over 450,000 members, which ensures that our facilities are built and maintained with a safe, highly-qualified workforce.

CRC believes that by providing flexibility in reduction methods will maximize the positive impact of the Innovative Crude provisions while ensuring an ample supply of crude oil for California refineries.

Carbon Capture and Sequestration Protocol

As the only major California-only producer, CRC stands apart in its commitment to California's economic sustainability. CRC has incurred approximately $148 million for greenhouse gas allowances and approved offsets through California's Cap and Trade program since 2013 which benefit the state's Greenhouse Gas Emission Reduction Fund. Further, CRC has established 2030 Sustainability Goals throughout our operations for

Carbon, Methane, Renewables and Water which advance the State's 2030 goals and aid in our life-of-field planning process. The Company's goals are measured against a 2013 baseline, which is the year before CRC's launch as an independent company and the state's baseline year under SB 1383.

Our Carbon Sustainability Goal is to design and permit a carbon dioxide capture system at the Elk Hills Power Plant with carbon dioxide enhanced oil recovery (EOR) at Elk Hills Field, which is directly connected to the proposed rulemaking. This project would make the Elk Hills Power Plant, which generates electricity for up to 350,000 homes, as well as the Elk Hills Field, effectively carbon-neutral. In reviewing the CCS protocol as applied to the types of reservoirs in California that may serve as CO2 storage, CRC believes that the requirements of the protocol are overly prescriptive, restrictive and too expensive to implement and maintain, meaning that no such project would be built. We note that many of these burdens were identified in detail in the December 4, 2017 letter to staff by a broad consortium of experts including representatives of academia, industry (including CRC), and non-governmental organizations. The letter can be accessed here:
https://www.arb.ca.gov/fuels/lcfs/workshops/12042017_coalition.pdf

CRC highlights here our top concerns as we evaluate how to apply the proposed regulation to carbon capture and CO2 EOR at Elk Hills Field:

- Injection Pressure: Limiting pressure to 80% of sequestration zone parting pressure, per Step Rate Test inflection, is overly restrictive and could hinder EOR processing rates to the point of rendering EOR/CCS projects uneconomic. There are two primary technical reasons to revise this requirement:

    1. Breakdown pressure of the upper confining layer or geologic seal is the limit that should be established and must not exceeded. Minor near-wellbore displacement of the reservoir sands, as established via step rate tests, is very common in moderate permeability sands under fluid injection, and it has no effect on cap rock integrity and poses no risk to zonal sequestration.

    2. Establishing a limit of 80% seems arbitrary and overly restrictive. This is also inconsistent with state UIC regulations.

- Annular Pressure Requirement: Maintaining the annulus immediately above the packer at 100-200 psi above the tubing bottom hole pressure is unnecessary to maintain confinement of the injectate and increases the risk of environmental and safety incidents without providing any benefit. Injection packers are designed to operate under differential pressures, thus reducing persistent stress on the wellbore casing and wellhead, both of which combine to provide the final containment barrier. In the event of a packer leak, the required surface casing pressure monitoring equipment would immediately indicate leakage and the need for corrective intervention.

Holding high back-pressure on the casing is a risk to casing integrity and to safety. In EOR operations, the casing is designed to accommodate pressure changes from dynamic injection behavior, such as thermal expansion during water alternating gas operations, and there is no need to artificially increase the back-pressure.

- 100 Year Operator Monitoring: This requirement is excessive and the duration basis is questionable. This burden on operators will likely discourage most EOR/CSS activity.

- Downhole seismic monitoring: The requirement for permanent downhole seismic monitoring at every injector is cost prohibitive. EOR/CSS projects will include dozens or hundreds of injectors, and there is no need for such monitoring given the growing array of sensitive surface seismic networks.

- Monitoring the CO2 plume: This process could become cost-prohibitive. One example would be the stated goal to track the "pressure front" associated with an injectate plume. Repeated post-shut-in 3D seismic surveying would also be very costly and not provide any corresponding benefit, particularly since it is ineffective under certain geologic conditions.

- Plugging and Abandonment of all wells within 24 months of CSS Injection Termination: This would not be practical in large scale EOR projects involving dozens or hundreds of wells. Additionally, producers will likely remain active for some time following CSS completion.

CRC champions a diverse mix of in-state energy sources because we recognize locally produced oil and natural gas sources complement and enable renewable sources. These sources work best in tandem, since an all-of-the-above local energy supply:

- Underpins affordability and reliability, particularly for working families and disadvantaged communities
- Honors consumer choice by residents and businesses from all parts of the state
- Encourages businesses and employers to locate in California and hire and invest in Californians
- Enables efficient use of existing infrastructure and complementary land use in longstanding oil and gas fields
- Maximizes overall energy efficiency
- Promotes California's history of innovation and technology development
- Welcomes global investors by harnessing market forces instead of arbitrary government mandates
- Provides energy security against global turmoil, price spikes and transportation disruptions
- Increases our resiliency to recover from natural or human-caused disasters.

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CRC looks forward to working with the state to construct and operate successful CI reduction measures that will provide Californians with the social, economic and environmental benefits of affordable, reliable and secure energy for California by Californians. Please feel free to contact me at 661.529.4453 or Brian Pellens at 661.529.4384 if you have any questions on this matter.

Sincerely,

Mike Glavin
Director, Sustainability
California Resources Corporation

cc: Sam Wade, Chief Transportation Fuels Branch
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