June 24, 2022

Ms. Rajinder Sahota
Deputy Executive Officer - Climate Change & Research
California Air Resources Board
1001 I Street
P.O. Box 2815
Sacramento, CA 95812

Re: Comments on 2022 Scoping Plan

Dear Ms. Sahota,

California Resources Corporation (CRC) is pleased to provide the following comments on the draft scoping plan. CRC applauds the efforts to map out a pathway to carbon neutrality for the state, an effort complicated by the sheer complexity of the economic interactions between sectors and vast number of people living in widely different locals and climates. As such, we encourage the California Air Resources Board (CARB) to consider the impact of energy transition to all communities in California, utilize proven methods of carbon capture and sequestration, and incentive the oil and natural gas industry to invest in energy transition by updating Low Carbon Fuel Standard (LCSF) and Cap-and-Trade protocols. Finally, we recommend CARB should account for the full life cycle emissions for all energy production.

CRC Background

As a company that operates exclusively in California, CRC is committed to helping the state meet its ambitious climate goals, including transitioning the economy to meet net zero greenhouse gas (GHG) emissions by 2045. CRC announced a Full-Scope Net-Zero Goal in November 2021, which includes achieving permanent storage of captured or removed GHG emissions equal to our Scope 1, 2 and 3 emissions by 2045. This means CRC will permanently store carbon in amounts equal to our direct emissions (scope 1), emissions from energy we use and that is produced by others (scope 2) and emissions from downstream processing and use of our products (scope 3) by 2045. CRC is actively designing innovative technologies for deployment at our fields and facilities to decrease the carbon intensity (CI) of our oil, natural gas and electricity production, and we aim to develop California's first commercial-scale carbon capture and sequestration (CCS) project.

CRC is an independent oil and natural gas company committed to energy transition in the sector. CRC has some of the lowest CI production in the US and we are focused on maximizing the value of our land, mineral and technical resources for decarbonization by developing carbon capture and storage and other emissions reducing projects. CRC has a large portfolio of lower-risk conventional opportunities in the San Joaquin, Los Angeles, and Sacramento basins. CRC explores

for, produces, gathers, processes and markets crude oil, natural gas and natural gas liquids. CRC's highly qualified workforce specializes in applying advanced technology to efficiently operate critical energy infrastructure under world-leading safety, labor, human rights and environmental standards.

The Role of California's Oil and Natural Gas Industry in the Energy Transition

The oil and natural gas industry has an important role in lowering carbon emissions in concert with the goals of the Scoping Plan. By better balancing these reductions across the economy, California can achieve carbon neutrality by 2045 in a significantly more cost-effective manner. Because California already has the highest costs in the nation for electricity and transportation fuels, borne in large part by disadvantaged communities, it is imperative that we remain mindful of the economic impact energy transition will have on our communities across the state.

CRC agrees with CARB that a complete phaseout of oil and gas extraction and refining is not possible by 2045. CRC is aligned with CARB's assessment of the unlikely feasibility of phasing out oil and gas production in California, and the logical nexus to continued demand for refined fuels in the state as discussed on page 79 of the Draft Scoping Plan. CRC also supports the position that a non-demand-based premature elimination of low carbon intensity in-state crude production will result in a net increase in globe-warming emissions via "leakage" outside of California. Additionally, the social and economic benefits of a thriving legacy California industry would be needlessly lost. CARB should strongly consider further studying and quantifying the leakage risk associated with its current policies that limit permitting for future oil and natural gas development. With an eye towards minimizing carbon intensity of California-produced crudes into the future, production via miscible carbon dioxide (CO_2) injection with permanent carbon storage should be championed.

CARB CCS Protocol in Cap-and-Trade and Incorporation of CCS into other Sectors

CRC believes a CCS protocol needs to be incorporated into the Cap-and-Trade program. Currently, there is no incentive for emitters to capture CO_2 because there is no decrease in Cap-and-Trade compliance obligation for CO_2 that is captured and sequestered (i.e., not emitted). This inclusion will incentivize near-term emissions abatement across key industrial processes (cement, combined heat and power [CHP], and Natural Gas Combined Cycle power generation) with significant current emissions not otherwise economically addressable. Per the 2020 EFI/Stanford report on CCS in California, up to 45 million metric tons per year of CO_2 emissions (~11% of California's total) can be removed with this inclusion.[1] CARB should allow and model the use of CCS on natural gas power plants. This is a much more cost-effective alternative to achieve low-carbon energy than the existing plans for battery and hydrogen storage.[2] Also noted in the EFI/Stanford report, CARB issued Resolution 10-42 in 2010 which committed to incorporating "a public process to establish a protocol for accounting for sequestration of CO_2

[1] *An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges and Solutions*. Energy Futures Initiative/Stanford Center for Carbon Storage, October 2020.

[2] *Optionality, Flexibility, and Innovation: Pathways for Deep Decarbonization in California*. Energy Futures Initiative, May 2019.

through geologic means and recommendations for how such sequestration should be addressed in the Cap-and-Trade program." Following through on this 2010 commitment will be a significant enabler to California meeting our short- and long-term emissions targets.

Lifecycle Emission Reduction via Miscible CO_2 Enhanced Oil Recovery

In-state CO_2 enhanced oil recovery (EOR) projects are a clear opportunity to produce the lowest possible CI fuels, at scale, while simultaneously driving economic opportunity and local economic impact in our under-served communities. Per studies by the Clean Air Task Force [3] and International Energy Agency (IEA)[4], conventional CO_2 miscible EOR with sequestration will deliver crude products with full-scope lifecycle net emissions impacts 35% to 55% below the cleanest crudes currently produced or imported into California. Additionally, CO_2 EOR projects operated to maximize storage via higher CO_2 utilization rates can deliver lifecycle emissions reductions beyond 100% of base emissions, thus generating a carbon neutral to carbon negative barrel of crude.[4, 5, 6] Given this clear benefit, the last barrel of petroleum fuel used in California should be made from crude produced and refined in California and developed via CO_2 EOR.

Additional tangible benefits of utilizing captured CO_2 for EOR in California include: 1) Enhanced project economics that will accelerate capture project implementation, transportation infrastructure build-out and technology development. This technology development will be leveraged world-wide to achieve global emissions ambitions far beyond California's direct impact. 2) Re-purposing existing infrastructure utilizes developed land footprints, thus minimizing the ecological and land use change impacts of expansive renewable energy installations. 3) Mature oil and natural gas reservoirs are proven and established storage containers over geologic time. In addition, the oil and gas industry's workforce has more than 50 years of CO_2 EOR experience and technical expertise which underpins our ability to safely and permanently handle and store CO_2 in an EOR setting.

Leakage and Full Lifecycle Emissions in the LCFS

CARB is obligated under AB 32 to minimize the "leakage" potential of any of their regulatory activities. Because some amount of petroleum fuels will be needed beyond full roll out of any electric vehicle mandate, the early retirement of combustion equipment and the elimination of oil and gas production and refining will result in significant levels of leakage of emissions outside of the state.

Further, by not including the embedded emissions associated with manufacturing, transporting, and installing solar panels, windmills and batteries to power the grid, CARB's carbon accounting for LCFS credit generation and modeling for net zero is flawed in that it ignores these off-balance-sheet carbon debts as this equipment is manufactured and imported from out of state. The

[3] *Carbon Capture & Storage in the United States Power Sector*. Clean Air Task Force, February 2019.
[4] *Storing CO2 through Enhanced Oil Recovery*. Organisation for Economic Co-operation and Development (OECD)/ International Energy Agency (IEA), 2015.
[5] *Stepping Up To Bring Emissions Down* (2022 Q1 Investor Deck). Oxy Low Carbon Ventures, March 2022.
[6] *Denbury 2Q2021 Earnings Presentation*. Denbury, August 5, 2021.

National Renewable Energy Laboratory estimates the CI of solar-powered electricity to be 43 grams of CO_2 equivalent per kilowatt-hour (gCO_2e/kWh) of electricity generated. With battery storage adding 33 gCO_2/kWh, total system CI is an average of 76 gCO_2/kWh – better than many alternatives, but clearly not zero.[7] To put this another way, that 76 gCO_2/kWh is equal to 21 grams/megajoule which is in excess of the emissions of oil production and refining in the lifecycle of most petroleum fuels.

The LCFS protocol needs to be updated to reflect full lifecycle emissions of fuels and technologies. For example, while solar generation has zero scope 1 and scope 2 emissions, it most certainly has emissions in the manufacture, transport, and installation of the infrastructure itself, which are scope 3 emission categories. So that global emissions are indeed reduced under the lifecycle of fuels as required by the LCFS, scope 3 emissions from solar energy must be calculated and included when evaluating projects for LCFS crediting, both for existing and new projects. In addition, large-scale solar energy installations require a change in land use to capture the sun's energy. While a minor input in oil production lifecycle emissions, the proposed increase in land use for solar and other renewables will have GHG emissions impacts due to land use change in California (and surrounding states) and could increase land use change emissions around the world as productive farmland is turned over to solar infrastructure.

Further, CARB should account for the lifecycle emissions of associated battery production inside and outside of California, including mining for resources, recycling, and disposal, to ensure there is no leakage of emissions due to the proposed zero-emission vehicle (ZEV) strategy. CARB uses an energy economy ratio (EER) to account for the greater efficiency of electric vehicles (EV) compared with internal combustion (IC) engines but does not account for the greater inputs (i.e., GHG emissions) of the manufacture of batteries in EVs compared to IC engine components and drivetrains. The greater EER of EVs comes at a significant GHG investment which is not accounted for in the state's policies.

Thank you for the opportunity to provide comments on the draft plan. We look forward to working with CARB on the future rulemaking that is prompted by the plan.

Regards,

Chris Gould

Chris Gould
Executive Vice President and Chief Sustainability Officer
California Resources Corporation

[7] *Life Cycle Greenhouse Gas Emissions from Electricity Generation: Update*. National Renewable Energy Laboratory, September 2021.