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Honorable Liane M. Randolph
Chair, California Air Resources Board
1001 I Street
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Re: Comments on the Development of California's 2022 Climate Change Scoping Plan Update

Calpine, an industry leader in the development and operation of clean, efficient and low-emitting natural-gas fired and geothermal electric generation in California, appreciates the opportunity to submit initial public comments on the development of California's 2022 Climate Change Scoping Plan Update to achieve a 40% reduction in greenhouse gas ("GHG") emissions below 1990 levels by 2030, and carbon neutrality by 2045. The State's carbon goals—among the most ambitious in the nation—are laudable, but face the very real prospect of being rendered illusory if the State does not consider all technological solutions at its disposal. The 2017 Climate Change Scoping Plan required California, pursuant to Executive Order B-30-15 and SB 32,¹ to double the rate of its emissions reductions²; however, studies suggest that California may be decades late in meeting its climate targets if swift and comprehensive action is not undertaken to accelerate the rate of emission reductions.³

The Lawrence Livermore National Laboratory, in a February 2021 report, emphasized that "California must not only intensify efforts in emission reduction measures and technologies that are already under way but must also deploy technologies that dramatically reduce existing

¹ Executive Order B-55-18, issued in 2018, further ordered carbon neutrality by 2045 and net-negative emissions thereafter.

² CARB, CALIFORNIA'S 2017 CLIMATE CHANGE SCOPING PLAN, at ES4 (Nov. 2017), https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf?_ga=2.28664956.150047977.1625591130-346616115.1623876637; *CARB Approves Plan to Meet California's Bold Climate and Air Quality Goals*, CARB (Dec. 14, 2017), <https://ww2.arb.ca.gov/news/carb-approves-plan-meet-californias-bold-climate-and-air-quality-goals/printable/print>

³ See, e.g., *California Green Innovation Index*, NEXT 10 (Oct. 2019), <https://www.next10.org/sites/default/files/2019-10/2019-california-green-innovation-index-final.pdf>.

emissions from large sources such as industry, and also remove carbon from the atmosphere directly.”⁴ Foremost among these technologies is carbon capture and sequestration (“CCS”), which is an established and cost-effective technology that California is uniquely well-suited to deploy due to its existing gas and gas generation infrastructure as well as the presence of geologic formations that are conducive to permanent and safe sequestration.

There is an extensive body of evidence demonstrating that CCS is a viable and important near-term option for California in meeting its GHG reduction targets in 2030 and beyond.⁵ The Energy Futures Initiative (“EFI”) and Stanford University issued a joint report in late-2020 that concluded that “the targeted use of CCS could be one of the largest single contributors” to achieving California’s emission reduction goals.⁶ The report exhorted that “California cannot afford to limit its flexibility by eliminating technology options or pursuing unfocused or suboptimal policies that may hinder, rather than accelerate, decarbonization” and advised that California policymakers consider “immediate actions to promote targeted deployment of CCS” if CCS “is to play a meaningful role” in meeting the state’s climate ambitions.⁷

⁴ LAWRENCE LIVERMORE NAT’L LABORATORY, PERMITTING CARBON CAPTURE & STORAGE PROJECTS IN CALIFORNIA, at 2 (Feb. 2021).

⁵ See, e.g., A. Cohen et al., *Clean Firm Power is the Key to California’s Carbon-Free Energy Future*, ISSUES IN SCI. & TECH. (Mar. 24, 2021), <https://issues.org/california-decarbonizing-power-wind-solar-nuclear-gas/>; LAWRENCE LIVERMORE NAT’L LABORATORY, PERMITTING CARBON CAPTURE & STORAGE PROJECTS IN CALIFORNIA (Feb. 2021); E3, ACHIEVING CARBON NEUTRALITY IN CALIFORNIA: PATHWAYS SCENARIOS DEVELOPED FOR THE CALIFORNIA AIR RESOURCES BOARD, at 22 (Oct. 2020), https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf; LAWRENCE LIVERMORE NAT’L LABORATORY, GETTING TO NEUTRAL: OPTIONS FOR NEGATIVE CARBON EMISSIONS IN CALIFORNIA (Aug. 2020), https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf; ENERGY FUTURES INITIATIVE, OPTIONALITY, FLEXIBILITY & INNOVATION: PATHWAYS FOR DEEP DECARBONIZATION IN CALIFORNIA, at xx, 32, 79-83, 150-54, 230-35, 295-96, App’x B (May 2019), https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5ced6fc515fcc0b190b60cd2/1559064542876/EFI_CA_Decarbonization_Full.pdf.

⁶ ENERGY FUTURES INITIATIVE, STANFORD PRECOURT INSTITUTE FOR ENERGY & STANFORD CENTER FOR CARBON STORAGE, AN ACTION PLAN FOR CARBON CAPTURE AND STORAGE IN CALIFORNIA: OPPORTUNITIES, CHALLENGES, AND SOLUTIONS, at S-1 (Oct. 2020), <https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5f91b40c83851c7382efd1f0/1603384344275/EFI-Stanford-CA-CCS-FULL-10.22.20.pdf> (citing OPTIONALITY, FLEXIBILITY & INNOVATION, ENERGY FUTURES INITIATIVE (May 2019)) [hereinafter, “AN ACTION PLAN FOR CARBON CAPTURE AND STORAGE IN CALIFORNIA”].

⁷ *Id.* at S-2.

CCS has paramount economic advantages that benefit working communities and critical sectors alike. CCS has the potential to rapidly reduce emissions from vital industrial and electricity sector sources that are integral to the reliability of California's grid, while simultaneously providing jobs to those that may be otherwise affected by the clean energy transition.⁸ CCS is also a critical technology for reducing emissions in harder-to-abate sectors.⁹ As the EFI-Stanford report estimates, California has the potential to store 60 MtCO₂/year—the equivalent of total electricity sector emissions in 2017—for 1,000 years,¹⁰ and numerous reports corroborate that the State's ideal natural geology enables safe sequestration of captured carbon.¹¹ Accordingly, CCS provides the means to rapidly reduce carbon emissions, preserve reliability of the electric grid and other critical sectors, and concomitantly facilitate an equitable clean energy transition.

At the federal level, the Biden-Harris Administration has expressly recognized that CCS and environmental justice are not mutually exclusive but rather complementary. President Biden's vanguard American Jobs Plan ("AJP") vows to "accelerate responsible carbon capture deployment and ensure permanent storage"—including through the establishment of "ten pioneer facilities that demonstrate carbon capture retrofits for large steel, cement, and chemical production facilities"—

⁸ *Id.* at S-3, S-4; *see also* An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges, and Solutions, Presentation on the Study Results by the Project Executives, at 19 (Oct. 22, 2020),

<https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5f9739146a54d17debd6808f/1603746076400/EFI-Stanford-CA-CCS-Slides-ForWeb-10.26.20vF.pdf>.

⁹ IEA, SPECIAL REPORT ON CARBON CAPTURE UTILISATION AND STORAGE: CCUS IN CLEAN ENERGY TRANSITIONS, at 21 (Sept. 2020). https://iea.blob.core.windows.net/assets/181b48b4-323f-454d-96fb-0bb1889d96a9/CCUS_in_clean_energy_transitions.pdf; E3, ACHIEVING CARBON NEUTRALITY IN CALIFORNIA: PATHWAYS SCENARIOS DEVELOPED FOR THE CALIFORNIA AIR RESOURCES BOARD, at 63-64 (Oct. 2020), https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf; *Institute Holds Briefing in California: IPCC 1.5 Deep Dive – The Role of Carbon Capture in California's Energy Transition*, GLOBAL CCS INSTITUTE (Mar. 14, 2019), <https://www.globalccsinstitute.com/news-media/latest-news/institute-holds-briefing-in-california-ipcc-1-5-deep-dive-the-role-of-carbon-capture-in-californias-energy-transition/>.

¹⁰ AN ACTION PLAN FOR CARBON CAPTURE AND STORAGE IN CALIFORNIA, at S-6.

¹¹ *Cf.* E. Burton et al., *Informing Policy Development for Geologic Carbon Sequestration in California*, 1 ENERGY PROCEDIA 4617, 4620 (2009); WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP ("WESTCARB"), AN OVERVIEW OF GEOLOGIC CARBON SEQUESTRATION POTENTIAL IN CALIFORNIA (Sept. 30, 2005), <https://www.osti.gov/servlets/purl/903323>; E. Burton, WESTCARB Technical Director, Lawrence Livermore National Laboratory, Presentation on "Carbon Capture & Sequestration in the California Context," at 11, 23, https://www.nrdc.org/sites/default/files/glo_10062101c.pdf; AN ACTION PLAN FOR CARBON CAPTURE AND STORAGE IN CALIFORNIA, at S-6.

“all while ensuring that overburdened communities are protected from increases in cumulative pollution.”¹²

In addition to supporting large-scale sequestration efforts that “leverage the best science and prioritize community engagement,” the AJP would expand the Section 45Q tax credit for carbon oxide sequestration, “making it direct pay and easier to use for hard-to-decarbonize industrial applications, direct air capture, and retrofits of existing power plants.”¹³ The Clean Air Task Force estimates that the AJP “could grow U.S. carbon management capacity by more than 13 fold by 2035 while safeguarding and creating tens of thousands American jobs and establishing the U.S. as a global leader in innovation and decarbonization.”¹⁴ The AJP makes clear that CCS is not at odds with, but rather supports, environmental justice; CCS is a critical component to modernizing the power sector and supporting the clean energy transition, and can also provide a technologically sound and responsible way to decarbonize industry in potentially affected communities.

The White House Council on Environmental Equality (“CEQ”) has reinforced these sentiments in its June 2021 Report to Congress on Carbon Capture, Utilization, and Sequestration (“CCUS”). The report determines that “[t]o reach the President’s ambitious domestic climate goal of net-zero emissions economy-wide by 2050, the United States will likely have to capture, transport, and permanently sequester significant quantities of carbon dioxide (CO₂).”¹⁵ The report thereby outlines the incentives, policies, and infrastructure in place, or still needed, to accelerate widespread deployment of CCUS across the country, with a view to benefiting “all communities.”¹⁶

¹² *FACT SHEET: The American Jobs Plan*, WHITE HOUSE (Mar. 31, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/>.

¹³ *Id.*

¹⁴ *The American Jobs Plan: What’s in it for Carbon Capture?*, CLEAN AIR TASK FORCE (Apr. 22, 2021) (footnotes omitted), <https://www.catf.us/2021/04/the-american-jobs-plan-whats-in-it-for-carbon-capture/>.

¹⁵ COUNCIL ON ENVIRONMENTAL QUALITY REPORT TO CONGRESS ON CARBON CAPTURE, UTILIZATION, AND SEQUESTRATION (June 30, 2021), <https://www.whitehouse.gov/ceq/news-updates/2021/06/30/council-on-environmental-quality-delivers-report-to-congress-on-steps-to-advance-responsible-orderly-and-efficient-development-of-carbon-capture-utilization-and-sequestration/>.

¹⁶ *Council on Environmental Quality Delivers Report to Congress on Steps to Advance Responsible, Orderly, and Efficient Development of Carbon Capture, Utilization, and Sequestration*, WHITE HOUSE (June 30, 2021) (quoting CEQ Chair Brenda Mallory); *see also* COUNCIL ON ENVIRONMENTAL QUALITY REPORT TO CONGRESS ON CARBON CAPTURE, UTILIZATION, AND SEQUESTRATION (June 30, 2021), <https://www.whitehouse.gov/ceq/news-updates/2021/06/30/council-on-environmental-quality-delivers->

Similarly, lawmakers in Congress—Democrats and Republicans alike—have introduced multiple bills to encourage the wide-scale deployment of CCUS, acknowledging the promise that CCUS holds to substantially contribute to our nation’s emission reduction goals.¹⁷ Carbon capture, moreover, is a key element of the United States’ new Nationally Determined Contribution under the Paris Agreement, which identifies carbon capture as a pathway to decarbonize both electricity and industry in the United States.¹⁸

As the foregoing reflects, on both a national and international level, CCUS has been recognized as an integral component of the United States’ plan to reduce GHG emissions. Indeed, the International Energy Agency (“IEA”) has unequivocally stated that “[t]he next decade will be critical to the prospects for CCUS and for putting the global energy system on a path to net-zero emissions,” concluding that “[w]ithout a sharp acceleration in CCUS innovation and deployment over the next few years, meeting net-zero emissions targets will be all but impossible.”¹⁹ The IEA’s own modeling projects that CCUS will be “increasingly called upon . . . to achieve the deep emissions cuts needed in the United States,”²⁰ envisioning a scenario where the initial focus is placed on retrofitting fossil-fuel-based plants and supporting low-carbon hydrogen production, followed by a shift to net removals of CO₂ through direct air capture (“DAC”) and as a source of climate-neutral CO₂ for synthetic aviation fuels.²⁰

As this and other studies recognize, however, market forces alone are unlikely to be sufficient to cause wide-scale deployment of CCUS.²¹ Rather, policy (and policymakers) will play a critical role in encouraging viable and sustainable deployment of CCUS. As CARB develops its 2022 Climate Change Scoping Plan Update, the agency should accordingly advance policies that

report-to-congress-on-steps-to-advance-responsible-orderly-and-efficient-development-of-carbon-capture-utilization-and-sequestration/.

¹⁷ This legislation includes the Carbon Capture, Utilization, and Storage Tax Credit Amendments Act of 2021 (S. 986), the Coordinated Action To Capture Harmful (CATCH) Emissions Act (H.R. 3538), the Storing CO₂ And Lowering Emissions (SCALE) Act (S. 799), as well as the Energy Act of 2020, the latter of which Congress enacted into law in December 2020.

¹⁸ *The United States’ Nationally Determined Contribution - Reducing Greenhouse Gases in the United States: A 2030 Emissions Target*, UNFCCC, at 3-4 (Apr. 2021), <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United%20States%20of%20America%20First/United%20States%20NDC%20April%2021%202021%20Final.pdf>.

¹⁹ IEA, SPECIAL REPORT ON CARBON CAPTURE UTILISATION AND STORAGE: CCUS IN CLEAN ENERGY TRANSITIONS, at 151 (Sept. 2020). https://iea.blob.core.windows.net/assets/181b48b4-323f-454d-96fb-0bb1889d96a9/CCUS_in_clean_energy_transitions.pdf.

²⁰ *Id.* at 14, 129-30.

²¹ *See, e.g., id.* at 3, 150.

allow the full potential of CCUS technology to be realized, if the State is to achieve its climate ambitions.

CARB has already acknowledged that CCS is an “important strategy to reduce greenhouse gas (“GHG”) emissions and mitigate climate change” and that studies demonstrate that CCS “may be an integral part of meeting California’s long term climate goals.”²² In fact, CARB’s 2017 Climate Change Scoping Plan Update cites CCS as a “potential new, long-term path for reducing GHGs for large stationary sources” and proposes developing regulatory measures to support the implementation of CCS projects.²³ Even more recently—after two years of public engagement, modeling, and interagency collaboration—CARB defined CCS as among the “critical” processes that could remove CO₂ from the atmosphere and identified the streamlined deployment of CCS and DAC as among the “Immediate Least Regret Actions” that could be undertaken to meet California’s GHG goals and deep decarbonization.²⁴

Reinforcing these findings, CARB launched its 2022 Scoping Plan Update process by citing the important role that CCS can play in achieving carbon neutrality by 2045 and net-negative emissions by mid-century.²⁵ Upon that launch, CARB has suggested that the State should “[m]aximize all sinks with [the] goal of achieving net negative,” emphasizing the importance of CCS, DAC and natural and working lands as the three legs of the stool the State can rely upon to achieve net negative emissions. Taking any of those three legs off the table would be unwise, in terms of both carbon reduction and economic development.

As the EFI-Stanford study favorably observed, “[t]apping into California’s CCS potential can lead to . . . Regional CCS Hubs,”²⁶ spurring the creation of additional investment, jobs, and infrastructure. Calpine is working with other partners to develop a hub concept to enable efficient decarbonization of clustered emissions, located near ideal geologic storage locations. Calpine has two CCUS pilot projects currently under development. The first project, with Blue Planet, is testing innovative carbon utilization technologies that would initially capture approximately five tons of CO₂ per day in producing low carbon-intensity substitutes for concrete, with the intent of eventually reaching commercial scale. The second project, with ION Clean Energy, supported by

²² *Carbon Capture & Sequestration*, CARB, <https://ww2.arb.ca.gov/our-work/programs/carbon-capture-sequestration/about>.

²³ CARB, CALIFORNIA’S 2017 CLIMATE CHANGE SCOPING PLAN, at 70, 72 (Nov. 2017), https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.

²⁴ *California’s Greenhouse Gas Goals and Deep Decarbonization*, CARB, at 13, 16 (Nov. 19, 2020), <https://ww3.arb.ca.gov/board/books/2020/111920/20-12-5pres.pdf>; *Carbon Neutrality*, CARB, <https://ww2.arb.ca.gov/our-work/programs/carbon-neutrality>.

²⁵ *2022 Scoping Plan Update Kick-off Workshop*, CARB, at 18 (June 8, 2021), https://ww2.arb.ca.gov/sites/default/files/2021-06/carb_overview_sp_kickoff_june2021.pdf.

²⁶ AN ACTION PLAN FOR CARBON CAPTURE AND STORAGE IN CALIFORNIA, at S-3-S-13, 62.

a Department of Energy grant, is testing efficient new capture technologies that offer the promise of making carbon capture at gas-fired power plants cost effective.

Beyond these demonstration-scale projects, Calpine is also working on commercial scale projects to bring CCUS to market in the near term. Our projects for retrofitting CCGTs with CCS could help de-risk investments in CCS technology at harder-to-abate sources and help realize the emission reduction opportunities among those sectors. Yet all of these projects take substantial commitment of investment from proponents. While federal government tax credits help with project financing and the Low Carbon Fuel Standard (“LCFS”) provides a strong incentive for CCS opportunities associated with the production of transportation fuels and DAC, sources in both the power sector and hard-to-abate sectors need additional certainty to undertake large capital investments that retrofit their facilities with CCUS, including the certainty that their power asset will count as zero carbon and be procured under long-term agreements. Climate exigencies—and California’s own climate goals—necessitate that CARB go beyond the 2017 Climate Change Scoping Plan Update and, in the 2022 Update, define and/or develop the “regulatory monitoring, reporting, verification, and implementation methodology for the implementation of carbon capture and sequestration projects” as CARB proposed in 2017.²⁷

To this end, the State should issue policy guidance clarifying that CCUS is an eligible resource under SB 100, as part of the mandate that all retail electricity sales be from renewable and carbon-free sources by 2045.²⁸ The Environmental Defense Fund and the Clean Air Task Force, supported by research groups from Princeton University, Stanford University, and Energy and Environmental Economics (“E3”), all concluded that relying on solar and wind alone would be neither realistic nor sufficient to reach net-zero emissions in California’s electricity sector by 2045.²⁹ Instead, a “better solution” for the State would be to develop “clean firm power,” which

²⁷ Cf. CARB, CALIFORNIA’S 2017 CLIMATE CHANGE SCOPING PLAN, at 72 (Nov. 2017), https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.

²⁸ See, e.g., AN ACTION PLAN FOR CARBON CAPTURE AND STORAGE IN CALIFORNIA, at S-12, 112.

²⁹ A. Cohen et al., *Clean Firm Power is the Key to California’s Carbon-Free Energy Future*, ISSUES IN SCI. & TECH. (Mar. 24, 2021), <https://issues.org/california-decarbonizing-power-wind-solar-nuclear-gas/>. As the report found, relying on solar and wind power alone “would require building the system up to nearly 500 gigawatts of power-generating capacity,” which “is roughly half the capacity of the entire United States electricity generating system today,” just to serve California. According to the study’s authors, not only “may [it] simply not be possible to build renewable facilities at this scale”—“most of which [would] seldom [be] used”—but “[t]his excess capacity would be expensive,” causing wholesale electricity rates in California to increase “by about 65% over today if renewable energy and currently available storage technologies alone were to be used to meet demand in 2045.” *Id.*

would include retrofitting power plants and deploying CCUS to safely capture and store emissions permanently underground.³⁰

As another critical policy action to support CARB's climate objectives, the State should incorporate CCUS into the existing cap-and-trade program, by adopting a protocol akin to the LCFS CCS Protocol, to incentivize the deployment of CCUS on a larger scale, beyond just transportation fuels and DAC. Just as under the existing CCS Protocol, this protocol could include safety, risk-mitigation, and monitoring provisions to safeguard potentially affected communities.

At bottom, if the 2022 Scoping Plan Update is to advance beyond the 2017 Scoping Plan and set California on a viable path to achieving its climate objectives, the Update must include CCUS. Backed by ample scientific research and a Presidential administration that recognizes both the environmental justice imperatives and opportunities that climate change mitigation represents, CCUS should be a key pillar of CARB's 2022 Scoping Plan Update. CARB has the responsibility to closely evaluate, and integrate, CCUS into the forthcoming Scoping Plan Update as one of the largest single potential contributors to California's emission reduction efforts by 2030 and deep decarbonization by 2050.³¹

Calpine appreciates CARB's consideration of the above comments as the agency launches its 2022 Climate Change Scoping Plan Update process.

Sincerely,



Kassandra Gough
Vice President, Government & Regulatory Affairs
Calpine Corporation

³⁰ *Id.*

³¹ See AN ACTION PLAN FOR CARBON CAPTURE AND STORAGE IN CALIFORNIA, at S-1; ENERGY FUTURES INITIATIVE, OPTIONALITY, FLEXIBILITY & INNOVATION: PATHWAYS FOR DEEP DECARBONIZATION IN CALIFORNIA, at xvii-xviii (May 2019), https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5ced6fc515fcc0b190b60cd2/1559064542876/EFI_CA_Decarbonization_Full.pdf; see also *Carbon Capture*, C2ES, <https://www.c2es.org/content/carbon-capture/> (referring to CCS as “the only practical way to achieve deep decarbonization in the industrial sector”).