



1215 K Street #2210
Sacramento, CA 95814
916-443-2500

May 8, 2024

Submitted Electronically

Rajinder Sahota, Deputy Executive Officer
California Air Resources Board
1001 I Street
Sacramento, California 95814

Re: Comments in Response to Public Workshop on Potential Amendments to the Cap-and-Trade Regulation

Dear Deputy Executive Officer Sahota,

Calpine Corporation submits these comments in response to the California Air Resources Board's ("CARB") April 23, 2024 public workshop on potential amendments to the Cap-and-Trade Regulation.

Calpine operates the largest fleet of natural gas combined-cycle ("NGCC") and combined heat and power ("CHP") facilities in the United States. Calpine is also the nation's largest producer of renewable geothermal electricity. Together, its generation resources are capable of delivering approximately 26,000 megawatts ("MW") of clean, reliable electricity to customers and communities in 22 U.S. states and Canada, with more than 76 power plants in operation or under construction. Calpine also operates and is developing battery storage projects, with 80 MW in operation and 1,500 MW in development.

Calpine has long supported federal and state efforts to address climate change and reduce GHG emissions, including those from the power sector. Calpine was the only power company to submit a brief to the Supreme Court in *Massachusetts v. EPA* in support of the U.S. Environmental Protection Agency's ("EPA") authority to regulate greenhouse gas ("GHG") emissions.¹ It has long supported California's Cap-and-Trade Program and is also among several power companies defending California's authority under the Clean Air Act to establish and enforce its own GHG and zero-emission vehicle standards for light-duty vehicles, which will drive electrification of the transportation sector and achieve significant reductions of both GHG and criteria pollutant emissions.²

¹ See Brief of Amicus Curiae Calpine Corporation in Support of Petitioners, *Massachusetts v. EPA*, 549 U.S. 497 (2007) (No. 05-1120), 2006 WL 2563379.

² See Final Brief for Industry Respondent-Intervenors, *Ohio v. EPA*, D.C. Cir. No. 22-1081 (Mar. 20, 2023) Doc. # 1990950.

Calpine is a major innovator in piloting the use of carbon capture and storage (“CCS”) to achieve reductions in emissions from NGCC and CHP facilities.³ Last December, as part of DOE’s implementation of the Carbon Capture Demonstration Projects under the Infrastructure Investment and Jobs Act, the DOE Office of Clean Energy Demonstrations announced up to \$540 million in funding for two of Calpine’s CCS projects.⁴ Baytown Carbon Capture and Storage Project will capture up to 2 million metric tons of CO₂ each year from our CHP plant in Baytown, Texas and sequester it in saline storage sites on the Gulf Coast. Sutter Decarbonization Project will capture up to 1.75 million metric tons of CO₂ each year from the Sutter Energy Center near Yuba City, California and deploy a novel air-cooling system to minimize water usage—a critical innovation in California.⁵ This recognition of Calpine’s Sutter Decarbonization Project by DOE is poised to help support achievement of reductions needed to achieve the 2022 Scoping Plan’s targets.

As a pioneer of CCS to reduce emissions from NGCC and CHP facilities, Calpine focuses its comments on the role that CCS will need to play in the State’s strategy to achieve the 2022 Scoping Plan’s targets of reducing anthropogenic GHG emissions to forty-eight percent (48%) below 1990 levels by 2030 and eighty-five percent (85%) below 1990 levels and carbon neutrality by 2045.⁶

I. Calpine is the industry leader in developing and piloting CCS to reduce carbon dioxide emissions from existing natural gas-fired power plants.

Calpine is currently pursuing CCS projects on its NGCCs and CHP units to reduce CO₂ emissions in California. In addition to the Sutter Decarbonization Project, Calpine has two pilot projects underway at Los Medanos Energy Center, a cogeneration plant in Pittsburg, California, and is advancing full-scale CCS retrofits at several other sites across the country.

³ Although gas-fired power plants are expected to operate less frequently in coming years, they will continue to supply non-duration-limited dispatchable capacity needed to ensure the reliability of the electricity grid, as increasing volumes of intermittent renewable electricity are integrated into the system. According to one study, “the provision of reliable capacity (MW) in a decarbonized electricity system is fundamentally separate from the provision of energy (MWh),” such that “gas generating capacity comparable to today’s is needed in a carbon-neutral energy system,” although the average capacity factor of natural gas-fired combined-cycle power plants will drop dramatically after peaking by the middle of this decade. James H. Williams, et al., *Carbon-Neutral Pathways for the United States* (2021), *AGU Advances*, <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2020AV000284>.

⁴ *OCED Selects Three Projects in CA, ND, and TX to Reduce Harmful Carbon Pollution, Create New Economic Opportunities, and Advance Carbon Reducing Technologies*, DOE Office of Clean Energy Demonstrations (Dec. 14, 2023), <https://www.energy.gov/oced/articles/oced-selects-three-projects-ca-nd-and-tx-reduce-harmful-carbon-pollution-create-new>.

⁵ DOE Office of Clean Energy Demonstrations, “Carbon Capture Demonstration Projects, Selections for Award Negotiations,” <https://www.energy.gov/oced/carbon-capture-demonstration-projects-selections-award-negotiations>.

⁶ See Cal. Health and Saf. Code § 38562.2(c) (codifying the 2045 targets pursuant to the California Climate Crisis Act, Assembly Bill (“AB”) 1279, Muratsuchi, 2022).

On July 14, 2023, Calpine unveiled a \$25 million pilot project at Los Medanos Energy Center, with funding from the Department of Energy’s National Energy Technology Laboratory (“DOE-NETL”), to use a solvent process developed by ION Clean Energy to capture as much as 95% of the CO₂ emissions from a gas-fired power plant.⁷ The project is sized to capture 10 tons of CO₂ per day.⁸ Improving on previous solvents, ION’s proprietary new low-VOC amine solvent creates a faster bond with carbon dioxide (thus requiring less solvent, lower equipment costs, and lower transportation expenses) and has greater stability (which allows it to be cycled and reused for longer periods of time without losing capture efficiency).⁹ These features will likely reduce the cost of a carbon capture system.

At the ribbon-cutting ceremony for the ION Clean Energy pilot project, CARB Chair Liane Randolph called CCS a “critical tool” in fighting climate change and meeting the state’s carbon neutrality targets, and California Natural Resources Agency Secretary Wade Crowfoot stated that the project was a “big step forward.”¹⁰ As Calpine CEO Thad Hill also stated, “[t]he deployment of carbon capture on (energy) plants, like the one sitting here — a plant that is reliable, that is safe, that is efficient — will really change the world.”¹¹

Calpine is also partnering with Blue Planet at Los Medanos Energy Center to pilot the use of its innovative technology to utilize captured carbon.¹² Blue Planet’s geomimetic mineralization technology combines the captured carbon with calcium sourced from waste.¹³ This process creates synthetic limestone aggregate and carbon-negative concrete that can be used as a light-weight building material.

Calpine is also completing two Front-End Engineering Design (“FEED”) studies for implementation of CCS: one at Delta Energy Center, a combined-cycle facility in Pittsburgh,

⁷ Judith Prieve, *First-of-its Kind East Bay Pilot Project to Capture Harmful Emissions Could Be Game-Changer for Gas-Powered Plants*, SAN JOSE MERCURY NEWS (Jul. 15, 2023), <https://www.mercurynews.com/2023/07/15/calpine-unveils-pilot-project-to-produce-cleaner-electricity-capture-harmful-emissions/>.

⁸ *Id.*

⁹ *What We Do*, ION Clean Energy, <https://www.ioncleanenergy.com/how-it-works> (last visited July 26, 2023).

¹⁰ Prieve, *First-of-its Kind East Bay Pilot Project*, *supra* at note 8.

¹¹ *Id.*

¹² *Calpine & Blue Planet Transform Captured Carbon Into Limestone*, Carbon Capture Magazine (Sept. 28, 2022), [https://carboncapturemagazine.com/articles/365/calpine-blue-planet-transform-captured-carbon-into-limestone](https://carboncapturemagazine.com/articles/365/calpine-blue-planet-transform-captured-carbon-into-limestone;);

¹³ *Blue Planet: Permanent Carbon Capture - Products*, <https://www.blueplanetsystems.com/products> (last accessed July 26, 2023).

California, and another at Deer Park Energy Center, a cogeneration unit in Deer Park, Texas.¹⁴ The Delta Energy Center FEED study explores the use of ION's solvent to capture 95% of site emissions for geologic storage in the nearby Sacramento Basin.¹⁵ The Deer Park Energy Center FEED study focuses on capturing 95% of the facility's 5 million tons of annual emissions using Shell's patented CANSOLV amine capture technology.¹⁶ These studies were funded by DOE grants in the amounts of \$5,811,210 and \$4,791,966, which comprised nearly one-quarter of the \$45 million that DOE dedicated to natural gas power and industrial sources pursuant to Funding Opportunity Announcement 2515.¹⁷ In announcing these awards, Secretary Jennifer M. Granholm emphasized that, "to dramatically reduce carbon pollution in our fight against climate change, we must deploy all of the tools at our disposal, including the innovative technologies that capture CO₂ emissions before they reach the atmosphere."¹⁸

Calpine is additionally negotiating the terms of a third DOE award for a FEED study at its Pastoria Energy Facility near Lebec, California. The proposed project will study the use of Honeywell UOP's Generation Two, amine-solvent-based PCCC system as applied to a nominal 750 MW NGCC facility. DOE intends to contribute up to \$7,000,000 to this project.¹⁹

Additionally, Calpine has entered into a Memorandum Agreement with the Sacramento Municipal Utility District ("SMUD") to negotiate a power purchase agreement for the output from the Sutter

¹⁴ *Funding Opportunity Announcement 2515, Carbon Capture R&D for Natural Gas and Industrial Point Sources, and Front-End Engineering Design Studies for Carbon Capture Systems at Industrial Facilities and Natural Gas Plants*, DOE Office of Fossil Energy and Carbon Management (Oct. 6, 2021), <https://www.energy.gov/fecm/articles/funding-opportunity-announcement-2515-carbon-capture-rd-natural-gas-and-industrial> (*DOE Funding Announcement*).

¹⁵ *Id.*; see ANDY AWTRY ET AL., DESIGN AND COSTING OF AN ION CLEAN ENERGY CO₂ CAPTURE PLANT RETROFITTED TO AN 857 MW NATURAL GAS COMBINED CYCLE POWER PLANT STATION (Nov. 30, 2022), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4288012.

¹⁶ See *DOE Funding Announcement*. CANSOLV is the same technology that has been used on coal plants, including SaskPower in Canada, since 2013. See Shell Global, *Shell's Cansolv CO₂ technology chosen for one of the world's largest carbon capture projects at a gas-fired cogeneration power station* (Dec. 15, 2021), <https://www.shell.com/business-customers/catalysts-technologies/resources-library/trade-release-shell-catalysts-and-technologies-and-calpine-deer-park-energy-center.html>.

¹⁷ *DOE Invests \$45 Million to Decarbonize the Natural Gas Power and Industrial Sectors Using Carbon Capture and Storage*, Dept. of Energy (Oct. 6, 2021), <https://www.energy.gov/articles/doe-invests-45-million-decarbonize-natural-gas-power-and-industrial-sectors-using-carbon>.

¹⁸ *Id.*

¹⁹ *Project Selections for FOA 2614: Carbon Management (Round 3)*, Dept. of Energy, <https://www.energy.gov/fecm/project-selections-foa-2614-carbon-management-round-3>.

Decarbonization Project located near Yuba City.²⁰ Under the proposed power purchase agreement, Calpine would make available and SMUD would have the right to dispatch the low-carbon energy and capacity from the CCS-retrofitted Sutter Energy Center.²¹

The facilities discussed above, like a large portion of Calpine’s fleet, are located near high-quality sequestration basins, including those within the Central Valley of California. As one report by the Energy Futures Initiative and Stanford University found, California has the potential to store 60 million tons of CO₂ each year—the equivalent of total electricity sector emissions in 2017—for 1,000 years.²²

In short, Calpine has been advancing a pipeline of CCS projects to reduce emissions from gas-fired power plants because—though challenges exist—CCS holds great promise to reduce emissions from both electricity generation and other sectors of the economy and to maintain reliability of the electricity system, as demand for electricity increases as other sectors are electrified, particularly in California.

II. Calpine encourages CARB’s to propose amendments to the Cap-and-Trade Regulation that will catalyze investment in CCS and recognize reductions achieved from sources covered by the Regulation.

CARB, the California Natural Resources Agency, California Department of Conservation and California Energy Commission held a set of meetings last year to discuss their respective roles in implementing a critical piece of legislation enacted in 2022, Senate Bill 905 (Caballero), which requires CARB to establish a Carbon Capture, Removal, Utilization, and Storage Program, and to adopt regulations for a unified permit application that will expedite the issuance of permits or other authorizations for the construction and operation of carbon capture, removal, utilization and storage projects in California.²³

In these meetings, you described the roles that CCS and other carbon management tools, including technological carbon dioxide removals (“CDR”), are anticipated to play in achieving AB 1279’s

²⁰ SMUD, *May 17, 2023 Board of Directors Meeting: Exhibit to Agenda Item #1*, https://www.smud.org/-/media/Documents/Corporate/About-Us/Board-Meetings-and-Agendas/2023/May/Exhibit_to_Agenda_Item_1---SMUD.ashx.

²¹ SMUD, *May 17, 2023 Board of Directors Meeting: Draft Memorandum of Agreement Between SMUD and Calpine*, <https://www.smud.org/-/media/Documents/Corporate/About-Us/Board-Meetings-and-Agendas/2023/May/ERCS-Info-Packet--May-17-2023.ashx>.

²² 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-6 (Oct. 2020), <https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5f91b40c83851c7382efd1f0/1603384344275/EFI-Stanford-CA-CCUS-FULL-10.22.20.pdf> (citing OPTIONALITY, FLEXIBILITY & INNOVATION, ENERGY FUTURES INITIATIVE (May 2019)).

²³ See Cal. Health and Safety Code §§ 39741.1, 39741.2.

goals; how the amendments to the Section 45Q tax credit enacted by the Inflation Reduction Act provide significant support for CCS and CDR;²⁴ and how, in light of this increased federal support, EPA's power plant rule identifies CCS as the best system of emission reduction for fossil fuel-fired power plants.²⁵

Calpine agrees that CCS promises to be a critical tool to achieve the State's emission-reduction objectives and that the incentives available under federal policy should help deploy it at scale in California, including at the Sutter Decarbonization Project. To that end, Calpine encourages CARB to propose amendments to the Cap-and-Trade Regulation and Mandatory Reporting Regulation, so that reductions occurring at covered sources as a result of implementation of CCS are reflected in their reported emissions and resulting compliance obligations. Otherwise, the price signal delivered by the Cap-and-Trade Regulation will not support the deployment of CCS at covered sources. Such common-sense amendments will drive ambition and innovation in pursuit of the Scoping Plan's targets.

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Please contact me at 916.491.3366 or Kassandra.Gough@calpine.com with any questions regarding these comments.

Sincerely,



Kassandra Gough
Vice President,
Government and Regulatory Affairs

²⁴ 26 U.S.C. § 45Q(a)(3)(A); (d)(1)(A).

²⁵ See OVERVIEW OF SB905 CARBON CAPTURE UTILIZATION AND SEQUESTRATION REQUIREMENTS (Aug. 15, 2023), https://ww2.arb.ca.gov/sites/default/files/2023-08/Overview%20of%20SB905%20CCUS%20Public%20Meeting%20PowerPoint_August%2015th%202023_0.pdf, at 15.