

Liane Randolph  
Chair, California Air Resources Board  
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**Re: 2022 Scoping Plan Update – Scenario Concepts Technical Workshop**

September 3, 2021

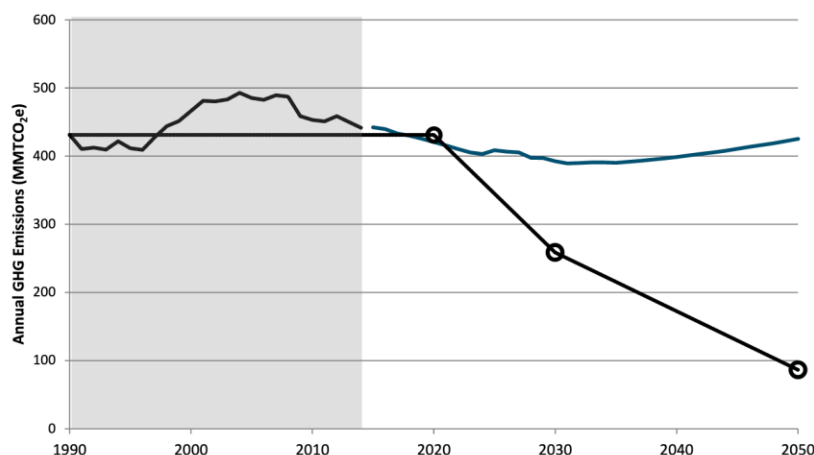
Dear Chair Randolph,

We thank you for the opportunity to comment on the August 17, 2021, scenario concepts workshop for the 2022 Scoping Plan Update. The Clean Air Task Force is an environmental non-profit dedicated to catalyzing the development and global deployment of low-carbon energy technologies, and other climate protective technologies, through research, public advocacy leadership, and partnerships with the private sector.

At a high level, California Air Resources Board (CARB) is considering a wide range of issues as part of the 2022 Scoping Plan Update. The Scoping Plan will set the course that California must take to meet these key climate goals. Given the importance of moving as expeditiously as possible on climate action, we encourage and support CARB's effort to remain on schedule to adopt an updated plan by the conclusion of 2022 as presented at the initial Scoping Plan kickoff workshop in June.

California has long been a climate leader and the state's mid-century climate goals are both an ambitious and challenging addition to this legacy. It is of particular importance that California has recognized the need to go beyond net-zero emissions and actually begin the process of removing CO<sub>2</sub> from our atmosphere in order to limit global warming. We offer the comments below on the potential role of engineered carbon capture, removal, and storage in California's decarbonization goals.

Currently available research suggests that California will need engineered carbon capture, removal, and storage to reach its goals. The chart below, CARB's Overview Presentation from Day 1 of the June 2021 workshop, shows that despite California's progress, the bulk of the decarbonization work lies ahead.



*Illustrative example of Reference Scenario and GHG Mitigation targets*

It is also clear that achieving carbon neutrality no later than 2045 and maintaining negative emissions thereafter will require new strategies in the state’s portfolio -- strategies that can drastically reduce or eliminate emissions from large point sources that do not have many other cost-effective decarbonization options (i.e. engineered carbon capture, removal, and storage).

We do not and cannot know in advance the exact mix of traditional mitigation efforts and carbon capture or carbon dioxide removal efforts that will be required. But multiple analyses at the international,<sup>1,2</sup> national and state level concur that carbon capture/removal will be necessary to meet mid-century climate goals and the importance of these technologies rises with the ambition of mitigation scenarios. For California, this means 10s of millions of tonnes of CO<sub>2</sub>/yr captured or removed and permanently stored, and this number could be upward of 100 million tonnes CO<sub>2</sub>/yr to account for shortcomings in other mitigation strategies and limitations to conventional decarbonization approaches.<sup>3,4,5,6,7</sup> Industries such as cement or steel would still

<sup>1</sup> IEA (2020), CCUS in Clean Energy Transitions, IEA, Paris. <https://www.iea.org/reports/ccus-in-clean-energy-transitions>

<sup>2</sup> IEA (2021), Net Zero by 2050, IEA, Paris. <https://www.iea.org/reports/net-zero-by-2050>

<sup>3</sup> E3, “Achieving Carbon Neutrality in California: PATHWAYS Scenarios Developed for the California Air Resources Board”, October, 2020. [https://ww2.arb.ca.gov/sites/default/files/2020-10/e3\\_cn\\_final\\_report\\_oct2020\\_0.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf)

<sup>4</sup> S. Baker et al., “Getting to Neutral: Options for Negative Carbon Emissions in California.” Lawrence Livermore National Laboratory, August 2020. [https://www-gs.llnl.gov/content/assets/docs/energy/Getting\\_to\\_Neutral.pdf](https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf)

<sup>5</sup> Energy Futures Initiatives and Stanford University “An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges, and Solutions.” October 2020. <https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5f96e219d9d9d55660fdbc43/1603723821961/EFI-Stanford-CA-CCS-FULL-rev1.vF-10.25.20.pdf>

<sup>6</sup> Eric Larson et al., “Net-Zero America: Potential Pathways, Infrastructure and Impacts”, Princeton University, December 15, 2020.

[https://netzeroamerica.princeton.edu/img/Princeton\\_NZA\\_Interim\\_Report\\_15\\_Dec\\_2020\\_FINAL.pdf](https://netzeroamerica.princeton.edu/img/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf)

<sup>7</sup> Williams, J. H., et al., “Carbon-neutral Pathways for the United States.” *AGU Advances* 2:1, January 2021. <https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2020AV000284>

emit carbon dioxide even if powered by clean energy, which highlights the need to utilize capture and storage technology.

Removing carbon dioxide from the atmosphere is only part of the challenge. Carbon dioxide also must remain stored/removed from the atmosphere. The security of different carbon dioxide removal options - i.e., how easily removal/storage gains might be reversed - is thus of great relevance to achieving carbon neutrality by 2045 in California. Engineered carbon mitigation combined with secure geologic storage, combined with appropriate accounting oversight can provide a secure pathway for carbon removal. Permitting standards developed by through the EPA's underground injection control program and greenhouse gas reporting program, combined with requirements developed by the California Air Resources Board for the Low Carbon Fuel Standards, allow for such an option to be used in California.

Although it is unlikely that reaching net-zero by 2035 or 2045 will be possible without engineered carbon removal, we welcome the diversity of data-driven scenarios; ranging from excluding carbon capture to relying heavily upon it. It is important that the engineered carbon removal scenarios include the industrial and power sector, in order to accurately model California's path to net-zero. None the less, it should be noted that engineered carbon removal can be accounted for and monitored accurately, and the success of these techniques is not affected by future climate volatility, which gives them a key advantage over nature-based solutions.

Finally, California can no longer afford to think only about reducing its emissions, but also must enhance its carbon sinks, both natural and engineered, to achieve negative emissions. Ensuring that these solutions can contribute at the scale of several 10s of millions of tons of CO<sub>2</sub> annually by mid-century is a substantial undertaking that needs to begin today. This requires planning and coordinated state government action, and we urge CARB to incorporate these dimensions in the current Scoping Plan update.

We thank CARB once again for the opportunity to comment and engage in this Scoping Plan Update and urge consideration of the full value of engineered carbon capture, removal, and storage technologies for California: carbon, air quality, and workforce transition. We are excited to see the results of the scenarios and are ready to provide further information on these technologies for the purpose of the Scoping Plan Update and beyond.

Respectfully submitted,

Marc Jaruzel, Clean Air Task Force