

**Testimony by Amber Mahone to the Joint Legislative Committee on Climate Change Policies
In the Informational Hearing on Achieving Climate Neutrality: Tradeoffs and Opportunities
March 10, 2022**

Thank you Chair Muratsuchi and thank you to the members of the Joint Legislative Committee on Climate Change Policies for inviting me to speak today on the topic of achieving climate neutrality in California.

I also appreciate the opportunity to speak to you virtually today. That simple accommodation has helped to reduce my carbon footprint, and the carbon footprint of this hearing.

My name is Amber Mahone, and I am a partner at Energy and Environmental Economics, also known as E3. E3 is an energy consulting and analysis firm that works across North America to support our clients in evaluating and implementing clean energy policies and technologies. In California, E3 works with all the state's energy agencies, including the Air Resources Board, the Energy Commission, and the Public Utilities Commission.

Currently, my team is supporting the Air Resources Board in performing an in-depth evaluation of economy-wide carbon neutrality scenarios to inform the 2022 Scoping Plan. This includes two scenarios that achieve carbon neutrality by 2045, and two scenarios that achieve carbon neutrality by 2035. The team will be presenting some of our preliminary modeling results in a public workshop next week, on Tuesday March 15th.

We also performed the electric sector modeling for the Joint-Agency SB 100 clean electricity analysis and are supporting the Integrated Resource Planning or "IRP" proceeding at the California Public Utilities Commission. Over the past 15 years at E3, my team and I have conducted many studies evaluating greenhouse gas reduction strategies across the country, including in California, New England, New York, the Pacific Northwest, Minnesota, Colorado and elsewhere.

In 2020, my team and I released a report on "*Achieving Carbon Neutrality in California*".¹ The California Air Resources Board sponsored the study to gather information in advance of the 2022 Scoping Plan about potential pathways and policies to help the state achieve carbon neutrality by 2045.

While my testimony reflects my personal views on this topic, these perspectives have been shaped by E3's extensive body of work within California and across North America.

My remarks are focused on three key points:

First: California has set ambitious climate goals, including the 40% GHG reduction requirement by 2030, and the goal of carbon neutrality by 2045. Carbon neutrality by 2035 is being further evaluated as part of the Scoping Plan effort currently underway.

¹ "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

Second: Achieving carbon neutrality is largely a physical, energy infrastructure challenge, which requires a wholesale transformation of the ways we produce and use energy.

Third and finally: While California's climate goals are ambitious, we don't yet have all of the policy, regulatory and financing mechanisms in place to implement this ambitious agenda.

What do I mean by the “physical, energy infrastructure challenge” of achieving carbon neutrality?

This means that the timing for reducing greenhouse gas emissions in California depends on how quickly the 25 million or so gasoline cars and light trucks, and millions of diesel trucks on the road today can be replaced by electric and zero-emission alternatives. It also depends on how quickly the 15 million or so homes, and millions of businesses and industrial facilities in the state can be retrofit to use clean electricity, or other zero-carbon fuels, for space and water heating, and to power a wide variety of industrial processes. And it depends on how quickly all kinds of other new zero-carbon energy infrastructure and carbon dioxide removal technologies can be built and deployed.

Achieving carbon neutrality is as likely to depend on mundane choices like what kind of car you and your neighbor drive, and how many years your neighbor's gasoline car remains on the road, as it does on industrial energy supply choices and the pace of renewable and zero-carbon electricity deployment.

In our 2020 modeling work, we evaluated three scenarios that achieve carbon neutrality in California by 2045. The most ambitious of these scenarios assumed that all fossil fuel emissions could be eliminated by 2045 through:

- a rapid transition to 100% all-electric and zero-emission sales for vehicles and building equipment by 2030.
- In addition, we assumed widespread production and use of zero-carbon electricity,
- renewably produced hydrogen,
- carbon capture and sequestration, and
- other advanced biofuels,
- along with other GHG-reducing measures in sectors like waste, agriculture, and
- reductions from other sources of high global warming potential gases
- In addition, in all of the scenarios that we evaluated, even with ambitious steps to reduce fossil fuel use, carbon dioxide removal, such as land-based carbon sequestration and direct air capture of CO₂, was a critical strategy needed to achieve carbon neutrality, despite being in the very early stages of commercialization today.

The study showed that achieving carbon neutrality by 2045 in California requires ambitious near-term actions around deployment of energy efficiency, transportation and building electrification, zero-carbon electricity, and reductions in non-energy, non-combustion greenhouse gas emissions as no-regrets strategies.

If we look back on the last ten years of climate policy in California, empirically, the largest driver of success for achieving California's 2020 climate goal, four years ahead of schedule, came from GHG reductions in the Electric Power sector. This was primarily driven by the Renewable Portfolio Standard. Critically, this law came with a built-in financing mechanism, in the form of regulated investor- and municipally owned utilities, and electric ratepayers.

Building codes and standards, ratepayer-funded energy efficiency programs and vehicle fuel economy standards have also been critical in reducing energy demand across the state. The low-carbon fuel standard and cap-and-trade program have both provided important incentives and funding for electric vehicle adoption and other carbon reducing measures.

Looking forward, we know that achieving deeper levels of greenhouse gas reductions will require new complementary policies and significant capital investments across every sector. The data are clear that reducing emissions from the electric sector alone will not be enough to meet our climate goals. We need to find new and creative ways to support the commercialization and deployment of zero-carbon technologies. The largest source of emissions in the state today comes from passenger vehicles. Accelerating the adoption of zero-emission vehicles is therefore critical.

We also know that California faces a housing crisis, and that building all-electric housing in urban centers, with access to public transit and electric vehicle charging, could help reduce our reliance on personal, gasoline-power vehicles, while simultaneously addressing the housing shortage. Californians need better access to clean and reliable public transportation, and safe biking and walking corridors, along with zero-carbon housing options. Sector-based solutions like these, and other complementary policies that support incentives and funding for accelerating the clean energy transition that is underway will help California make more rapid progress on meeting our climate goals.

The primary challenge that I see is not a lack of ambition, but a question of how we will finance these needed investments, and rapidly deploy and adopt new technologies in every sector, in a way that is equitable.