



Informational Hearing: “Achieving climate neutrality: Tradeoffs and opportunities”

OUTCOMES REPORT

OVERVIEW

The Joint Legislative Committee on Climate Change Policies held a hearing on March 10, 2022. At the hearing, the Committee received presentations on two studies that look at the various pathways to carbon neutrality. The Committee also heard from several speakers on reaching carbon neutrality within specific sectors and the tradeoffs and opportunities relating to accelerating action.

SUMMARY OF HEARING

Presentation by Amber Mahone, Partner, Energy + Environmental Economics (E3)

In 2020, my team and I released a report on “Achieving Carbon Neutrality in California”. 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.

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 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.

Presentation by Dr. Erin Mayfield, Assistant Professor, Dartmouth College's Thayer School of Engineering

Power point presentation. The power point presentation used by Dr. Mayfield in her testimony can be found on our website.

Presentation by Dr. Chris Busch, Research Director, Energy Innovation

California is a climate policy leader for the United States and the world. But we are not on track to meet our 2030 or 2045 climate goals. This is all the more worrisome because California also must strengthen our future targets to align with the latest science. California is also off track to deliver clean air for all our residents by 2030. Those suffering from air pollution typically contributed least to the problem and can least afford to escape it.

But there's good news too. Our electric power sector is decarbonizing at incredible speed, and California policy played a critical role jumpstarting the electric vehicle markets. Now the state must do the same to speed the adoption of heat pumps in buildings and industry. Phasing out fossil fuels and replacing them with clean affordable energy sources can help California build a stronger, fairer economy. Ambitious policies will spur a new wave of innovation and entrepreneurialism in the clean technologies increasingly in demand worldwide.

Electrification policies reduce Californian's exposure to volatile fossil fuel prices, a notable advantage when gas prices are spiking due to Russia's war against Ukraine.

My testimony spotlights the potential to electrify energy use in food processing, one of California's largest industries, and urge faster transportation electrification. California's leadership has provided crucial momentum for international climate efforts, but we must not relent. Humanity still has the chance to limit global warming to 1.5 degree Celsius as scientists urge, but success hinges on California's recommitment to be at the forefront of climate ambition.

Power point presentation. The power point presentation used by Dr. Mayfield in her testimony can be found on our website.

Presentation by Dr. Rebecca Dell, Program Director, ClimateWorks Foundation

Almost a quarter of California's greenhouse gases come from industry. This is simply too much to leave only to our cap-and-trade program. These emissions are roughly evenly split between manufacturing and the production, transportation, and processing of oil and gas. Most of the trajectory of the oil and gas sector's emissions will be determined by what happens in transportation, not at the industrial sites themselves, so I will focus the rest of this testimony on manufacturing.



The most direct and simplest route to eliminate these industrial greenhouse gas emissions is also the worst: close down our manufacturing facilities. However, though this would get those emissions off California's books, it wouldn't necessarily reduce greenhouse gas emissions. The same products would be produced elsewhere, perhaps even with greater climate damage.

California's manufacturing sector is something we can be justly proud of. It has nearly \$350 billion of output per year. This is the largest of any state in the United States. It also means that manufacturing is a larger portion of our state economy than the U.S. average. It provides high-quality employment, with the average employee in California's manufacturing sector earning \$112,000 per year in total compensation.

We need to combine policies that require emissions reductions at facilities with policies that create business opportunities for the cleanest firms and policies that support innovation in technology, markets, and business models. To illustrate how this might work, consider the cement industry. Cement is the largest source of manufacturing emissions in the state. With 2-3% of total state emissions, it is essential to tackle in its own right. However, globally, about 7% of greenhouse gas emissions come from cement, so if California can demonstrate technical, policy, and business feasibility of near-zero-greenhouse gas cement that can have much greater impact around the world. No one has figured this out yet, so California's leadership is badly needed.

Cement is also critical because addressing climate change across our economy will require that we build an enormous amount of new transportation and energy infrastructure. If we continue to use conventional cement, our efforts to climate damage could themselves become a driver of climate damage.

Finally, addressing the climate damage from cement will also help us to address its public health impacts. California's cement kilns are the only facilities remaining in the state that still rely on direct coal burning for their energy. They have some of the highest rates of SOx emissions, a critical local air pollutant. The impact of this pollution falls disproportionately on low-income communities and communities of color.

For all these reasons, the cement industry is the obvious first target in the manufacturing sector.

To decarbonize cement production, we need a comprehensive policy approach. We can build on the foundation of cap-and-trade, by increasing and better targeting the financial incentive to reduce greenhouse gas emissions.

We should also support innovation. Unlike many industries, less than half of cement's greenhouse gas emissions come from energy, while most come from the raw materials—CO₂ coming directly out of rocks. This means innovation is especially important. Cement is the only sector in which carbon capture and storage (CCS) will almost certainly be needed. We should support technology directly and facilitate early

deployments through things like infrastructure planning and permitting and regulatory support of geologic CO₂ storage. California's cement companies realize the need to decarbonize and are looking for policy support. Much of the cost of this effort can be shared with the federal government because of existing tax credits like 45q and recent funding from the Infrastructure Investment and Jobs Act.

We should create markets for near-zero-CO₂ cement through mechanisms like:

- *Buy Clean*: preferentially purchase low GHG cements for state-funded construction
- *Clean Product Standards*: mandate or incentivize GHG reductions in a particular product class, for example, as in the Low Carbon Fuel Standard
- *Building Codes*: require reductions in the GHG emissions associated with making building materials in addition to in the operations of buildings

California needs to address the climate damage that comes from its industrial sector while supporting its manufacturing economy. To do this, we should pursue a comprehensive policy approach that combines regulation, innovation, and market creation. If we move quickly and aggressively, we can dramatically reduce and perhaps eliminate greenhouse gas emissions from manufacturing activity by 2035.

Presentation by Dr. Dan Kammen, Professor of Energy, UC Berkeley/USAID

100% clean energy economy by 2035 is not only possible, but also an economic boom for California. 90% of new energy generation worldwide in 2020 and 2021 was from renewable energy. Solar accounted for 46% of all new electricity-generating capacity added in the US in 2021. This represents the third year in a row that solar has made up the largest share of new generating capacity in the US.

California has met, and now well exceeds, its one million solar roof mandate (SB 1), and the one million electric vehicle mandate, both of which were criticized as unrealistic when first proposed (2006 & 2010). California met its Renewable Portfolio Standard (RPS) target of producing 1/3 of electricity from clean sources over three years ahead of the target date of 2020. California passed and then met the target of AB 2514, to install 1.3 GW of storage by 2020.

California adopted a global-first standard of devoting 35% or more of Cap & Trade Revenues to be spent on fence-line, under-served, and minority communities.

California has now set targets of five million zero-emission vehicles by 2030 and the deployment of 250,000 light-duty or passenger ZEV chargers by 2025. Governor Newsom's allocation of \$10 billion for clean and just mobility is an important step that if used correctly will bring climate, social justice, and economic benefits to the state. The Biden Administration has adopted and advanced these California-developed targets in the form of federal commitments to a fully decarbonized national energy sector by 2035, and to Justice40, that allocates 40% of energy and infrastructure spending to positively impact underserved and minority communities.

Nationwide, residential solar installations totaled 4.2 GWdc in 2021, but the first time, California is no longer #1 nationwide in new solar energy installations.

California has stumbled in not aggressively pursuing a steady diet of accelerated targets. As the developer of the SWITCH model, I am well-acquainted with the benefits of energy systems modeling, but also the ‘paralysis by analysis’ of using staid, traditional models that emphasize costs and under-estimate or fail completely to capture the benefits of the Just Transition. Two points not well captured in existing models suffice to make this clear:

- It is cheaper to build renewable energy projects than it is to simply operate existing fossil fuel power plants.
- The benefits of renewable energy and energy efficiency over fossil fuels is significant: we observe up to two to three times more jobs per dollar invested in renewable energy, energy storage and energy efficiency than in fossil energy projects.

California has also stunted progress through the Public Utilities Commission Proposed Ruling that would blunt growth in the solar energy industry, retroactively tax early-adopters, and hurt the evolution of Net Energy Metering (NEM). California’s Behind-the-meter solar is a massive, under-valued, asset that benefits rate payers and utilities. It is important to stop this destructive war on solar, and instead aggressively move forward on innovate new goals that can be integrated into pending and future legislation and funding packages. Examples include:

- Giving the investor-owned utilities credit for new installations of distributed solar for low-income Californians, and give credit for solar + storage integrated installations for other consumers.
- Electric vehicle charging stations should become omni-directional vehicle-to-grid (V2G) connections to build storage capacity, improve, reliability, and pollution

KEY TAKEAWAYS

- California is not on track to meet our 2030 or 2045 climate goals.
- Achieving carbon neutrality by 2045 in California requires ambitious near-term actions.
- Achieving deeper levels of greenhouse gas reductions will require new complementary policies and significant capital investments across every sector.
- Accelerating adoption of zero-emission vehicles is critical.
- There are opportunities in accelerating action toward climate targets.
- Almost a quarter of California’s greenhouse gases come from industry.
- California needs to address the climate damage that comes from its industrial sector while supporting its manufacturing economy.
- We need to support innovation and a comprehensive policy approach.

- Addressing climate change across our economy will require that we build an enormous amount of new transportation and energy infrastructure.

NEXT STEPS / RECOMMENDATIONS

Numerous thoughts, ideas, and suggestions were shared at the hearing. Below is a list of recommendations for further action that were distilled from the information received.

- California should combine policies that require emissions reductions at facilities with policies that create business opportunities for the cleanest firms and policies that support innovation in technology, markets, and business models.
- California should bring forward the end-date for the sale of new internal combustion engine vehicles from 2035 to 2030, or earlier. At the same time, the recent \$10 billion commitment to EV mobility should be used to accelerate the deployment of smart (two way, V2G) connection points with a focus on low-income communities, and at the same time should work to make purchase and lease options at lowest cost to the most-needy populations.
- California should work with the U. S. Department of Justice and the White House to overturn the recent lower court decision to halt work on the Social Cost of Carbon (SCC). A California SCC would be a start.
- Develop a Nature-Based Solutions program of climate (& water) smart farming that rewards agricultural and forest practices that sequester carbon. A premium can be offered for CH₄ abatement and for programs that target socioeconomically disadvantaged farmers. This would enable the 2035 climate neutrality target.
- Housing policy is climate policy⁸: For climate and social justice reasons, California should facilitate re-zoning to integrate multi-family housing into the most desirable neighborhoods to build social cohesion, to share the benefits of the best infrastructure, and to re-energize public transportation of people and goods.
- California should accelerate the lease and build timelines for marine energy to supply electricity and green Hydrogen into the state economy. 10 GW of off-shore clean energy by 2030 is an achievable and massively job-producing goal.
- Akin to the Low Carbon Fuel Standard (S-7-01), California should launch a sustainable materials code that rewards the sale (and recycling) of solar cell and battery technologies that are manufactured with sustainably sourced Lithium, Cobalt, and other critical materials.