EARTHJUSTICE

SIERRA CLUB CALIFORNIA

September 3, 2021

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

Re: Scoping Plan Workshop Response to Staff Questions

Dear Ms. Sahota:

Earthjustice and Sierra Club California are pleased to provide comments on the California Air Resources Board's ("CARB") August 17th, 2021 Scoping Plan Workshop ("Workshop"). We strongly support Governor Gavin Newsom's call for accelerated climate action, and we appreciate CARB's efforts to incorporate pathways to carbon neutrality by 2035 in the Scoping Plan. In this letter, we provide direct responses to the questions from Staff's presentation during the Workshop on how the Scoping Plan should model accelerated timelines. Our cross-cutting recommendations across the sectors are that CARB:

1. Maximize near-term progress over establishing exact dates by which 100% neutrality for a given sector is reached; and
2. Accelerate solutions that help alleviate the disproportionate harm of extraction and combustion, and avoid false solutions that unnecessarily extend and exacerbate pollution burdens.

In practice, focusing on these two goals means immediately accelerating mass deployment of available, cost-effective, zero-emission solutions in a manner that prioritizes benefits in disadvantaged communities and communities of color.

We look forward to working closely with CARB on a Scoping Plan that charts the rapid, unprecedented transformation of our energy system necessary to avert greater climate catastrophe and to repair the deep injustice of our fossil-fueled energy system.

I. Carbon Neutrality Timeframe

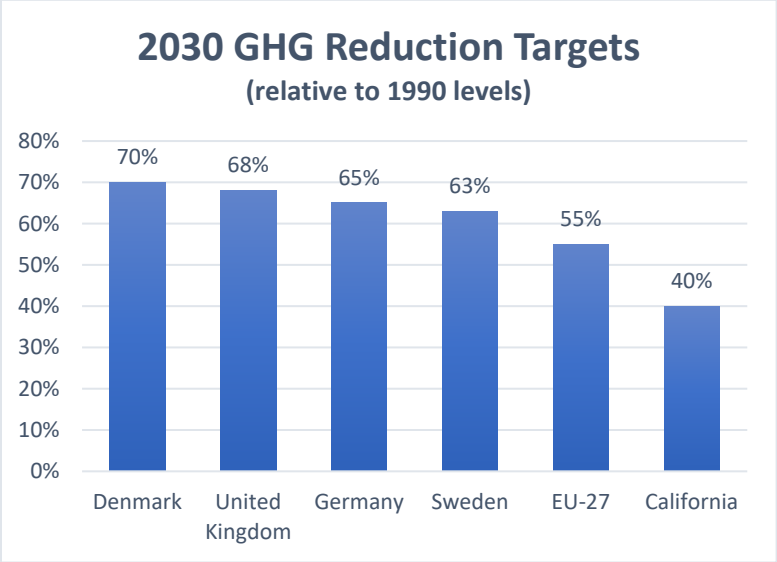
Earthjustice and Sierra Club California proposes the following Option for CARB's carbon neutrality targets in the Scoping Plan.

Proposed Option
• **Exceed SB 32 2030 Target**
• **Aim to achieve carbon neutrality by 2035**

A. Should the Scoping Plan "Increase ambition in 2030?"Yes. Significantly strengthening the 2030 target is even more important than the carbon neutrality date for the purposes of the Scoping Plan.

First, because climate change is driven by cumulative emissions, dramatic reductions in this decade matter just as much, if not more, than eventually reaching net-zero. Second, we strongly believe that the dynamic, non-linear course of most technology transitions (gradually, then suddenly)[1] means that the greatest role California can play in the fight against climate change is in propelling the global economy closer to these technology tipping points. Historically, CARB's regulations have successfully catalyzed research and development into new technologies, and helped incrementally introduce them into the market. Now, California must play an even more ambitious role by driving the mass-deployment of zero-emission technology and by rapidly eliminating combustion.

We recommend the Scoping Plan adopt a scenario that aims for an 80% reduction by 2030. As we explained in our July 9, 2021 comments,[2] California's current target of 40% below 2030 levels is outdated and indefensibly low, undermining the notion that our State is a climate leader. Several major climate leading nations that once had a similar 40% target, including Denmark, the United Kingdom, Germany, Sweden, and the European Union as a whole, have now responded to the climate science by strengthening their targets, thereby surpassing California.



[1] *See* RethinkX, Rethinking Climate Change: How Humanity Can Choose to Reduce Emissions 90% by 2035 through the Disruption of Energy, Transportation, and Food with Existing Technologies (Aug. 2021) https://www.rethinkx.com/climate-implications#climate-download.

[2] Earthjustice, Comments on Air Resources Board Scoping Plan Update (July 9, 2021) https://www.arb.ca.gov/lists/com-attach/118-sp22-kickoff-ws-UCNVMFwyWXpXOFc5.pdf

The 80% target will force necessary step increases in ambitious efforts across the board, and ensure agencies design regulatory ramps that prioritize lesson-learning through deployment, rather than through research**.** As we explained in our July 9, 2021 comment letter, there is precedent for establishing 80% as the interim target. Climate champions in the legislature have introduced Senate Bill 582 (Stern), which aims for this target,[3] and leading California climate and social scientists have outlined both the need and potential for an 80% target in 2030.[4]

B. Should the Scoping Plan "Achieve Carbon Neutrality in 2045, 2035, or other year?"

Earthjustice and Sierra Club California recommend that the Scoping Plan "aim to achieve" carbon neutrality by 2035.

We supports the Governor's request that CARB pursue carbon neutrality by 2035, and we believe that the Scoping Plan should model "aiming to achieve" carbon neutrality by 2035. While unprecedented cost declines in zero-emission technology and renewable energy should make rapid progress far easier than we previously thought, we acknowledge that infrastructure lifetimes, practical deployment speeds, and yet-to-be-commercialized technology solutions for certain sectors of the economy could make achieving neutrality by 2035 impractical. We have seen a handful of analyses that suggest at least 90% GHG reductions by 2035 are possible with existing technologies.[5]

Our concern with CARB's current set of options is that if Staff find carbon neutrality in 2035 is not possible with existing technologies, or not practical at currently-projected costs, then Staff may automatically punt to the 2045 target, even if earlier targets *are* feasible. It stands to reason that even if California does not achieve the 2035 target, it is better to come up just short of neutrality at 2035 and achieve the goal at a later date (e.g. 2038 or 2039) than to successfully meet targets that are unnecessarily weak. We therefore urge Staff to operationalize the Governor's request for more aggressive climate action by modeling pathways that "aim for carbon neutrality by 2035" and do not simply defer back a full decade if they rule out the exact 2035 date.

II. Role of Engineered Carbon Removal

[3] Senator Henry Stern, SB 582 – Climate Emergency Mitigation, Safe Restoration, and Just Resilience Act of 2021, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB582.
[4] Daniel Kammen et al, Accelerating the Timeline for Climate Action in California (Apr. 2021) https://arxiv.org/ftp/arxiv/papers/2103/2103.07801.pdf.
[5] *See e.g.,* Id.; J.T. Roberts et al, Faster and Steeper is Feasible: Modeling Deeper Decarbonization in a Northeastern US State (Feb. 2021) https://doi.org/10.1016/j.erss.2020.101891; and RethinkX, Rethinking Climate Change: How Humanity Can Choose to Reduce Emissions 90% by 2035 through the Disruption of Energy, Transportation, and Food with Existing Technologies (Aug. 2021) https://www.rethinkx.com/climate-implications#climate-download.

Earthjustice and Sierra Club California propose the following option with respect to the role of engineered carbon removal:

Proposed Option
• Exclude CCS for Fossil Fuel Combustion • Avoid CCS for Industrial Processes
• Include Carbon Removal (but restrict from use as offset)

A. "CCS with fossil fuel combustion – Yes or No?"

No.

CCS with fossil fuel combustion is neither carbon negative nor even carbon neutral--even proponents acknowledge 100 percent capture rates are not practically feasible.[6] Even if it were, addressing the carbon emissions from combustion alone cannot justify continued pollution of air, water, and soil for communities that have already borne the brunt of an extractive, combustion-based energy system. Adding to these harms, capturing, transporting, and storing carbon requires a host of new pipeline infrastructure, which poses grave safety hazards for the communities that are forced to host them.[7] Therefore, we do not see a role for CCS with fossil fuel combustion in achieving carbon neutrality.

Purely on climate grounds, and even as a transitory measure, CCS with fossil fuel combustion is not sensible. In practice, CCS capture rates have fallen woefully short of what their proponents say can occur in the best case.[8] In California, CCS would most likely be paired with gas combustion, in which case it would do nothing to address the substantial upstream emissions from methane leakage. Further, the process of capturing, compressing, transporting, and storing carbon is energy intensive—capture can consume 30-50% of the plant's energy output.[9]

Given the availability of zero-emitting energy generation resources, and the finite supply of safe

[6] Stanford School of Earth, Energy & Environmental Sciences, Optimal CO2 capture and storage to reduce the energy costs of CCS, https://pangea.stanford.edu/optimal-co2-capture-andstorage-reduce-energy-costs-ccs (last visited July 26, 2021)
[7] See e.g. Dan Zegart, "The Gassing of Satartia" (Aug 26, 2021) https://www.huffpost.com/entry/gassing-satartia-mississippi-co2-pipeline_n_60ddea9fe4b0ddef8b0ddc8f.
[8] Nan Wang et al, What Went Wrong? Learning from Three Decades of Carbon Capture, Utilization and Sequestration (CCUS) Pilot and Demonstration Projects (Nov. 2021) https://doi.org/10.1016/j.enpol.2021.112546.
[9] Craig Bettenhausen, The Life Or Death Race to Improve Carbon Capture, Chemical & Engineering News (July 18, 2021) https:// cen.acs.org/environment/greenhouse-gases/capture-fluegas-co2-emissions/99/i26.

geologic storage for captured carbon,[10] CCS does not negate the need to eliminate fossil fuel combustion for energy. As pointed out in the first Scoping Plan workshop, to the extent that we can draw down carbon and achieve negative emissions, we should.[11]

B. "CCS with industrial process – Yes or No?"

No, except where electrification or green hydrogen is genuinely infeasible. (NOTE, this also serves as our response to the Industrial Sector questions).

"Industrial processes" is a broad category of processes that may best be served by a range of mitigation options before needing to rely on carbon capture. In general, we oppose the use of CCS for control of emissions from energy or heat production. In cases where processes or feedstocks give rise to carbon emissions, a host of other options should first be considered. Demand-side approaches can substantially minimize the scale of reductions needed from this sector (e.g. material recycling, reductions in waste, improved product longevity) while delivering a host of co-benefits around reduced waste and increased circularity of the economy.[12]

On the supply side, several options can be considered prior to reliance on CCS. Energy efficiency and electrification can displace a substantial portion of direct energy-related emissions from fossil fuel derived energy and even high-temperature industrial heat. A study of industrial processes in Germany found that about 40% of gas used for industrial heat is for temperatures less than 100°C—like for food, beverage, and textile processing, packaging, and some chemicals processing.[13] This is well within the range of electric heat pumps. Even for higher temperature heating demands, other electricity based options are commercially established and can efficiently decarbonize heating up to 3500 C.[14]

In certain sectors, like chemicals and steel, green hydrogen—produced from renewably powered electrolysis—shows strong promise for decarbonizing fossil fuel derived feedstocks. Hydrogen produced from fossil fuel is already use for refining and chemical manufacturing (namely for ammonia fertilizer) and displacing fossil-derived hydrogen with green electrolytic hydrogen should be the priority, before devoting green hydrogen to sectors that can easily be electrified,

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[10] Laurie Goering, "Analysis – Scarce Carbon Storage Threatens Net-Zero Push as Emissions Keep Rising" (July 2, 2021) https://www.reuters.com/article/climate-change-carboncapture/analysis-scarce-carbon-storage-threatens-net-zero-push-as-emissions-keep-rising-idUSL5N2NL4CB

[11] Rajinder Sahota, 2022 Scoping Plan Kick-Off Workshop (June 8, 2021) at slide 18 https://ww2.arb.ca.gov/sites/default/files/2021-06/carb_overview_sp_kickoff_june2021.pdf.

[12] Jeffrey Rissman et al., Technologies and Policies to Decarbonize Global Industry: Review and Assessment of Mitigation Drivers through 2070 (May 2020) https://doi.org/10.1016/j.apenergy.2020.114848.

[13] Stefano Andreola *et al.,* No-regret hydrogen, Charting early steps for H2 infrastructure in Europe, Study, AFRY Management Consulting Limited, at 12 (Feb. 2021), https://static.agora-energiewende.de/fileadmin/Projekte/2021/2021_02_EU_H2Grid/A-EW_203_No-regret-hydrogen_WEB.pdf.

[14] *Id*. at 13.

like road transportation.[15] In steel production, green hydrogen can provide both high-temperature and replace coking coal in the iron-ore reduction process.[16] Only in very few "residual" sectors – for example cement manufacturing – will it be necessary to consider carbon capture for industrial processes.[17] Even there, we urge CARB to pursue options like transitioning to natural materials that can obviate the need for fossil fuels altogether.

C. Compensate remaining emissions with DAC? Yes or What?

Yes, carbon dioxide removal through direct air capture and enhanced natural sequestration are needed to balance non-combustion emissions and aim for net-negative greenhouse gases.

The IPCC has made clear that carbon removal is necessary for retaining any chance of limiting warming anywhere below 2 degrees. **We underscore that direct air capture is distinct from carbon capture and sequestration, a process that only mitigates the release of carbon, but does not independently remove it from the atmosphere.**

Though necessary, carbon removal will play a very minor role in reaching carbon neutrality and will never alter the need to rapidly reduce and ultimately eliminate extraction and combustion of fossil fuel. The moral hazard that has led environmental and environmental justice groups to oppose DAC is real – if industries operate DAC as a way of offsetting their continued pollution, they will continue harming communities while making it harder to reach carbon neutrality. CARB will have to pursue a community-led, transparent approach to governing and deploying DAC in a manner that allows California to draw-down some of its already-emitted carbon debt relative to less-developed nations, without perpetuating or replicating harm in our own communities. Some researchers and scholars have begun investigating principles for evaluating and incorporating carbon dioxide removal as just climate policy.[18]

III. Carbon Free Electricity Grid

A. Do we accelerate the 2030 RPS target?

Yes. Earthjustice and Sierra Club California support an RPS target of 90% by 2030. The RPS has been the "primary driver" for increasing clean electricity generation in California.[19] As the most recent Joint Agency SB 100 report acknowledges, "[a]lthough California is ahead of schedule in meeting its 33 percent renewable energy target by 2020 and on track to achieve 60

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[15] *See* Sasan Saadat and Sara Gersen, Reclaiming Hydrogen for a Renewable Future (Aug. 2021) https://earthjustice.org/sites/default/files/files/hydrogen_earthjustice.pdf#page=35&zoom=100,0,0.
[16] *Id*. at 23.
[17] Jeffrey Rissman et al., Technologies and Policies to Decarbonize Global Industry: Review and Assessment of Mitigation Drivers through 2070 (May 2020) https://doi.org/10.1016/j.apenergy.2020.114848.
[18] David Morrow et al, Principles for Thinking About Carbon Dioxide Removal in Just Climate Policy (Aug. 2020) https://doi.org/10.1016/j.oneear.2020.07.015.
[19] SB 100 Joint Agency Report, available at https://www.energy.ca.gov/sb100#anchor_report, p. 2.

percent renewable energy by 2030, deep decarbonization of the electricity sector to meet climate change objectives will require continued transformational change in the state's electric system."[20] Studies have already converged on the feasibility and economic favorability of achieving an 80% RPS by 2030.[21] To spur this transformational change, California should set a more ambitious target of 90% by 2030.

B. What year do we have a zero-carbon electricity grid?

Earthjustice and Sierra Club California believe that a zero-carbon electric grid can and should be achieved by 2035 or sooner. California has made significant strides is decarbonizing the grid. As noted above, it is on track to meeting the existing RPS target. Within the Integrated Resources Planning proceeding, the Public Utilities Commission is poised to set a 38 MMT target for most of the state's electric load-serving entities, which is an improvement from its prior 46MMT target in 2019.[22] These targets have spurred an unprecedented level of carbon-free resource procurement for the grid.

Even more ambitious targets are needed to avoid the worst effects of the climate disaster and end pollution that unjustly burdens the state's disadvantaged communities. By setting a 2035 zero-carbon goal, CARB will further stimulate the necessary transformation to a clean grid.

It is important to note that the achievement of interim targets is even more important that the actual year full neutrality is reached. From an emissions reduction standpoint, it is far better to set an ambitious target and accept that the final 5% is not achieved than to achieve far less ambitious goals.

C. Any role for biomass combustion to generate electricity?

No. Biomass facilities that burn solid biomass emit enormous amounts of pollutants per megawatt-hour of generation. A recent CPUC analysis has confirmed that biomass plants have high emission factors: "Among all the resource types considered in the [Commission Energy Division's February 2020] Updated Criteria Pollutant analysis, biomass facilities have the highest emissions factors for NOx and fine particulate matter, and the second highest emissions factor for SO2 (behind biogas)."[23] Indeed, biomass facilities can emit over 150% the nitrogen oxides, over 600% the volatile organic compounds, over 190% the particulate matter, and over

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[20] *Id*.

[21] Dan Esposito, Studies Converge on Benefits of a Rapid Clean Energy Transition (July 2021) https://energyinnovation.org/wp-content/uploads/2021/07/Studies-Converge-on-Benefits-of-a-Rapid-Clean-Energy-Transition.pdf

[22] See CPUC, Ruling Seeking Comments on Proposed Preferred System Plan, PLANhttps://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M399/K450/399450008.PDF

[23] Energy Division, Updated Criteria Pollutant Analysis at Slide 3 (Feb. 20, 2020), *available at* https://www.cpuc.ca.gov/General.aspx?id=6442459770)

125% the carbon monoxide of a coal plant per megawatt-hour.[24] These emissions can exceed those from a natural gas fired power plant for every major pollutant.[25] Biomass plants tend to be much less efficient than gas and coal-fired plants, in part because biomass fuels tend to have far more water content to burn off to produce "useful" energy.[26] What is more, numerous scientific studies show that the lifecycle GHG emissions from a biomass plant can exceed emissions from a fossil fuel-burning plant for several decades.[27] In addition to greenhouse gases and criteria pollutants, biomass facilities emit hazardous pollutants, including dioxins, lead, arsenic, mercury, and even emerging contaminants like phthalates.[28] All of these are dangerous to human health. Biomass and biofuel plants are often smaller plants than fossil fuel facilities and may not have the best available control technologies installed to limit air pollution meaning that these facilities could significantly increase air pollution and public health risks in communities.[29] Thus, these facilities have the potential to emit a lot of harmful pollution in local communities.

Given these extremely high levels of pollution, California should squarely reject biomass as a solution.

D. Any role for combustion of RNG or green H2 to replace fossil gas for reliability?

No. We can and must pursue a combustion-free electricity sector. Green hydrogen can help play a limited role for grid reliability when used in fuel cells.

Like biomass facilities and gas plants, biogas facilities also produce harmful pollution. In fact, studies have found that biogas plants can emit three times the nitrogen oxide emissions as natural

[24] Mary S. Booth, *Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal*, Partnership for Policy Integrity (Apr. 2, 2014), https://www.pfpi.net/trees-trash-and-toxics-how-biomass-energy-has-become-the-new-coal.
[25] Mary S. Booth, *Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal*, Partnership for Policy Integrity (Apr. 2, 2014).
[26] Mary S. Booth, *Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal*, Partnership for Policy Integrity (Apr. 2, 2014).

[27] Tara W. Hudiburg et al., *Regional carbon dioxide implications of forest bioenergy production*, Vol. 1, NATURE CLIMATE CHANGE 419 (2011), *available* at http://dx.doi.org/10.1038/nclimate1264; Jérôme Laganière et al., *Range and uncertainties in estimating delays in greenhouse gas mitigation potential of forest bioenergy sourced from Canadian forests*, Vol. 9 GCB Bioenergy 358 (2017), *available at* http://dx.doi.org/10.1111/gcbb.12327; Dominick A DellaSala and M. Koopman, *Thinning Combined With Biomass Energy Production May Increase, Rather Than Reduce, Greenhouse Gas Emissions*, GEOS INSTITUTE (2015), *available at* http://www.energyjustice.net/files/biomass/library/biomass_thinning_study.pdf .)
[28] Mary S. Booth, *Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal*, Partnership for Policy Integrity (Apr. 2, 2014) (describing how biomass plants emit these plants sometimes at higher rates than incinerators due to lax regulatory requirements).
[29] *See, e.g.,* Partnership For Policy Integrity, *Air Pollution from Biomass Energy,* https://www.pfpi.net/air-pollution-2.

gas plants.[30] Biogas plants can also emit high levels of volatile organic compounds including formaldehyde,[31] and sulfur dioxide.[32]

In addition, much of the RNG currently in the market lacks environmental integrity. There is currently no way to ensure that it results in any greenhouse gas reductions compared to fossil gas. Indeed, there is a significant risk that cans but used to "greenwash" fossil gas and distract decision makers from taking measures necessary to actually reduce GHGs such as the retirement of gas plants and building electrification.

Finally, certain sources of biomethane such a dairy confined animal feeding operations pollute air and water and disproportionately burden disadvantaged communities. [33]

Green hydrogen could serve a role in only limited circumstances – though through fuel cells—not combustion.

With respect to green hydrogen, as an initial matter, because there is no accepted definition, CARB should proceed carefully given the risk that hydrogen produced from fossil fuels risks increasing GHGs and other emissions.[34] To ensure its environmental integrity, the definition of green hydrogen should be very narrow and include only hydrogen produced exclusively with resources that qualify under the RPS, and the Commission should require users to retire all of the associated Renewable Energy Credits.[35]

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[30] Valerio Paolini, Francesco Petracchini, Marco Segreto, Laura Tomassetti, Nour Naja & Angelo Cecinato *Environmental impact of biogas: A short review of current knowledge,* JOURNAL OF ENVIRONMENTAL SCIENCE AND HEALTH, Part A, 53:10, 899-906 (2018), DOI: 10.1080/10934529.2018.1459076. Although biogas facilities can be controlled with pollution controls, they are less likely to have protective pollution controls, in part due to their size.

[31] Id. (citing Gallego, E. et al.. Impact of Formaldehyde and VOCs from Waste Treatment Plants Upon the Ambient Air Nearby an Urban Area (Spain). SCI. TOTAL ENVIRON. 2016, *568*, 369–380. DOI:10.1016/j.scitotenv.2016.06.007).

[32] Id. See also CPUC, Updated Criteria Pollutant Analysis, (Feb. 21, 2020), ftp://ftp.cpuc.ca.gov/energy/modeling/CriteriaPollutantAnalysisUpdate_20200221.pdf p. 6-7.

[32] Cal. Pub. Util. Code Section 454.52(I) (showing high SO2 levels).

[33] *See, e.g.,* Phoebe Gittelson, Danielle Diamond, Lynn Henning, Maria Payan, Lynn Utesch, and Nancy Utesch, *The False Promises of Biogas: Why Biogas Is an Environmental Justice Issue (May 26, 2021),* https://doi.org/10.1089/env.2021.0025; see also CPUC Decision Adopting Voluntary Pilot Renewable Gas Tariff, A.19-02-015 (Dec. 22, 2020) p. 37, ("Information provided by [Sierra Club and Leadership Counsel for Justice and Accountability] clearly establishes that many communities in the vicinity of dairies are already disproportionately burdened by environmental pollution, and community members feel strongly that developing RNG at dairies will perpetuate their adverse environmental impacts on the local community, may allow dairies to continue causing pollution (other than GHG emissions) and may facilitate expansion of dairies, even increasing the local environmental burdens.")

[34] *See* Sasan Saadat and Sara Gersen, Reclaiming Hydrogen for a Renewable Future (Aug. 2021) https://earthjustice.org/sites/default/files/files/hydrogen_earthjustice.pdf#page=35&zoom=100,0,0

[35] Sierra Club, Food and Water Watch, R.13-02-008, Reply Comments to the Joint Comments of Southern California Gas Company, San Diego Gas & Electric, Pacific Gas & Electric Company and

More importantly, even if the Commission were to adopt this proposed definition, use of green hydrogen for electricity production would be a costly and inefficient because electrolyzers require 3 to 3.5 times their installed capacity of renewable generation.[36] It is more prudent to reserve the resource for niche applications in difficult-to-abate sectors.[37] For example, research suggests that displacing the existing use of fossil fuel-derived hydrogen in the chemicals sector is the highest value application of green hydrogen, since the infrastructure already exists and the sector cannot easily be electrified.[38] Similar logic applies to its use for heavy transport, shipping and aviation.[39] These demand categories alone will be extremely challenging to supply with adequate volumes of green hydrogen.[40]

Further, the combustion of hydrogen-enriched natural gas produces significant quantities of criteria pollution, particularly NOx emissions. Two studies have found that burning this mix can lead to much higher NOx emissions,[41] up to six times that of burning methane.[42] Without

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Southwest Gas Corporation Regarding Hydrogen-Related Additions or Revisions to the Standard Renewable Gas Interconnection Tariff (March 8, 2021), p. 4.

[36] Josh Eichman and Francisco Flores-Espino National Renewable Energy Laboratory, California Power-to-Gas and Power-to-Hydrogen Near-Term Business Case Evaluation https://www.nrel.gov/docs/fy17osti/67384.pdf, p. 37.

[37] *See, e.g.*, Jochen Bard et al., Hydrogen in the Energy System of the Future: Focus on Heat in Buildings, (May 2020), https://www.researchgatenet/publication/342626296Hydrogenintheenergysystemofthefuture Focusonheatinbuildings, p. 11; Artelys, What Energy Infrastructure to Support 1.5C Scenarios?, Eur. Climate Found. (Nov. 2020), https://www.artelys.com/wp-content/uploads/2020/11/Artelys-2050EnergyInfrastructureNeeds.pdf

[38] *Id*.

[39] Eoin Bannon, E-fuel would be wasted on cars while it's badly needed to decarbonise planes and ships – study, Transport & Environment, (Dec. 7, 2020) https://www.transportenvironment.org/press/e-fuel-would-be-wasted-cars-while-it%E2%80%99s-badly-needed-decarbonise-planes-and-ships-%E2%80%93-study.

[40] *Id*.

[41] Sadler, Dan, et. al. H21 Leeds CityGate Project Report." City of Leeds, 2017, https://www.h21.green/wp-content/uploads/2019/01/H21-Leeds-City-Gate-Report.pdf, p. 163, Table 5.15 (Flame combustion of hydrogen resulted in "relatively high NOx," compared to natural gas flame combustion).

[42] Cellek, Mehmet Salih, and Ali Pınarbaşı. "Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen-Enriched Natural Gas and Hydrogen as Fuels." International Journal of Hydrogen Energy 43, no. 2 (January 11, 2018): 1194–1207. https://doi.org/10.1016/j.ijhydene.2017.05.107 ("In the case of using hydrogen-enriched natural gas or pure hydrogen instead of natural gas as the fuel, the combustion emissions … such as CO and CO2 are remarkably decreased compared to the natural gas. However, the NOx emissions are significantly increasing especially due to thermal NO."). See also ETN Global, Hydrogen Gas Turbines, https://etn.global/wp-content/uploads/2020/01/ETN-Hydrogen-Gas-Turbines-report.pdf, p. 9, (recognizing that one of the challenges for hydrogen combustion is that "[t]he higher adiabatic temperature of H2 will result in higher NOx emissions if no additional measures are undertaken" and

requiring additional measures to control NOx emissions, the combustion of hydrogen-enriched natural gas at existing power plants at best, requires further investigation, and at worst, risks increasing emissions.[43] **For this reason, if green hydrogen is considered at all for electricity generation, it should only be allowed in fuel cells, where the only product of the chemical reaction generating electricity is water.** Fuel cells have the added advantage of being more energy efficient and quieter, allowing them to be cited closer to load in urban areas, and helping avoid costly transmission.

Finally, the risk of hydrogen leakage in the pipeline system is poorly understood and must be further evaluated. Hydrogen is a greenhouse gas and its small size makes it especially prone to leakage.

IV. Vehicle Fleet Electrification

Earthjustice and Sierra Club California propose the following vehicle fleet electrification targets for the Scoping Plan:

Proposed Option
• Light Duty: 100% Sales by 2030 • Transit Buses: 100% Sales by 2030
• Medium and Heavy Duty: 100% Sales by 2035
• Off-road: 100% Sales by 2030

We strongly believe that hastening the burgeoning transition to a zero-emission transportation system (faster than currently proposed) is **CARB's greatest opportunity to accelerate emission reductions needed under any scenario.** Moreover, the road transportation sector is the largest state-wide source of NOx, making the immediate transition is necessary on public health grounds alone.

A. Change target of 100% ZE sales of LDV by 2035?

Yes. Set target for 100% ZE sales by 2030.

Light-duty combustion vehicles are the largest source of greenhouse-gas pollution in California, and zero-emission passenger vehicles are one of the lowest cost (indeed, cost-saving) measures for reducing GHGs. There is arguably no greater space for CARB to maximize near-term greenhouse gas reductions than to rapidly end the sale of combustion vehicles. While we believe a 100% sales mandate for 2025 may not be practical given the lag in production cycles and the

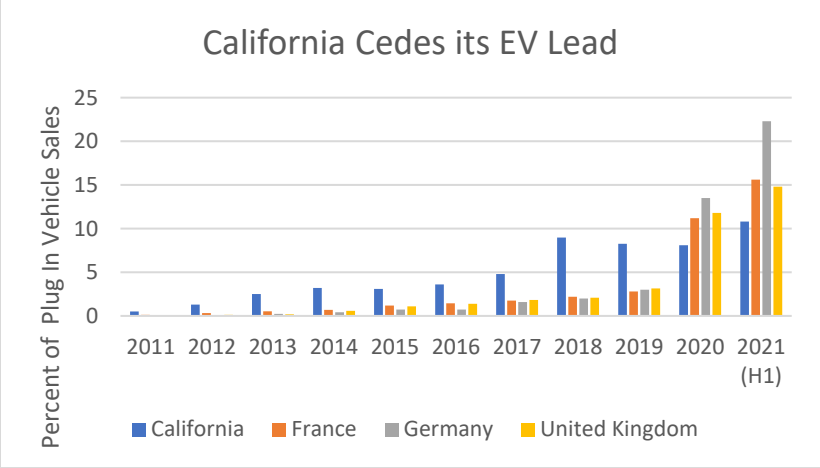
recommended that "[s]ome flexibility might be needed on NOx limits in future" for decarbonization through hydrogen.)

[43] Pub. Util. Code Section 454.52(a)(1)(H).

need to build out the charging network, we believe nearly half (45%) of new vehicle sales should be ZE by 2025, and that no new ICE vehicles should be sold after 2030.

CARB's current Advanced Clean Cars II rule, unfortunately, is utterly off track. The ZEV sales requirement is nowhere near in alignment with CARB's own Mobile Source Strategy (which itself fails to achieve carbon neutrality in the vehicle fleet by 2045). The starting point in 2026 does not build at all on sales projected in 2023, and even that level of sales is not guaranteed because the rule offers excessive flexibility in the use of credits that are sure to be generated by ZEV-only manufacturers. The disconnect between Staff's ACC II proposal and what the Governor has requested is glaring—CARB is only willing to push a rule that is essentially market-following.

We know that disruptive change can happen rapidly in this sector. Since the 2020/21 EU CO2 standards entered into force, EV sales have climbed into double digit percentages in almost every European country. Average market share exploded from 3% in 2019 to 11% in 2020.[44] Many countries with ZEV penetration rates that started below California's have now surged ahead of us.[45] Clear policy direction made the lurch even more dramatic in several countries. After they set 2030 phase-outs for ICE vehicles, Denmark's sales surged from 4 to 16.4% in a single year; Iceland's went from 22.2 to 52.4%.[46]



Source: CEC 2021, IEA Global EV Data Explorer

[44] Peter Mock and Sonsoles Diaz, Pathways to decarbonization: The European passenger car market, 2021–2035 (May 2021) at 32.

[45] France, the UK, Germany, Portugal and the Netherlands all have greater EV sales shares than California (in some cases significantly so), despite starting with similar or lower penetration rates in 2018. https://www.pewresearch.org/fact-tank/2021/06/07/todays-electric-vehicle-market-slow-growth-in-u-s-faster-in-china-europe/

[46] IEA, Global EV Data Explorer (Accessed Sept. 1, 2021) https://www.iea.org/articles/global-ev-data-explorer

We urge CARB to move this sector forward with confidence – California has been instrumental in delivering ZEV technology to the world, and there is no reason for us to trail so far behind other countries in their adoption.

B. Change target of 100% ZE drayage fleet by 2035?

Keep target for 100% ZE sales by 2023, and push for aggressive early action.

In our view, more important than changing the drayage target from 2035 is ensuring that a majority of the drayage fleet is electrified by or before 2030. We strongly support the stronger ambition by entities like the Port of San Diego to transition early—by 2030 instead of 2035—and urge CARB to support stakeholders that want to achieve greater ambition.[47] While we do not feel a need to alter the 2035 deadline, we remain concerned about a scenario that backloads the turnover or adds unnecessary cost by failing to take early action. The next 2 years are critical for ensuring that the vast majority of drayage truck retirements are turned over to ZE, rather than new combustion, which may clog the drayage fleet with combustion way beyond what is necessary. We welcome action by the CEC and CPUC to prioritize infrastructure installation that will support rapid deployment of ZE drayage trucks in disadvantaged, freight-adjacent communities.

For CARB's part, the Mobile Source Strategy requires 100% of drayage sales to be ZE in 2023. So far, we are concerned that CARB's regulatory portfolio may not achieve this. Trucks that move containers but do not enter ports or railyards are being missed by the draft ACF regulation, and day cabs covered by the "priority fleet" element of the rule do not transition these vehicles until 2039, undermining the Governor's Executive Order. We urge CARB Staff to ensure that any day cab tractors and trucks performing drayage duties fall into a priority fleet category with accelerated target dates that reach 100% ZE by 2035 latest.

C. Change target of 100% ZE fleet for MHD by 2045 (where feasible)?

Focus on target for 100% ZE *sales* by 2035.

Even if we were to leave the target of 100% ZE fleet for MHD by 2045 unchanged, CARB will need to revise forward its sales targets for this sector. CARB Staff have introduced a concept within the Advanced Clean Fleet Rule that sets a 100% sales ZE sales mandate by 2040.

Setting the date for 2040 is indefensible – CARB's own Mobile Source Strategy shows that 100% of all medium- and heavy-duty vehicles to be zero-emission by 2035 just to meet the State's oldest climate target: 80% reduction by 2050. The MSS also shows that several fleets (delivery, return-to-base) will need to hit 100% sales within this decade. **The most immediate correction that CARB should make is to ensure the final ACF rule sets the 100% ZE Sales**

[47] Port of San Diego, DRAFT Maritime Clean Air Strategy (Aug 2021) at ES-2 https://pantheonstorage.blob.core.windows.net/environment/Draft_Revised_MaritimeCleanAirStrategy_August2021.pdf

Mandate in 2035, in accordance with its own science. After, CARB will likely need to update the Advanced Clean Trucks (ACT) rule to provide a more stable ramp to the phase-out, with stronger early-year targets. We have proposed adopting the MSS's projections from 2029-2035 for Class 4-8 trucks as a requirement across all truck categories.

V. Residential and Commercial Buildings

Proposed Option
• **All new buildings all-electric by 2026**
• **100% all-electric appliance sales by 2030**
• **All existing buildings retrofitted by 2045**

A. What year should all new buildings be all-electric?

Immediately, but 2026 is the next best option given the overlay of the building code cycle.

While we acknowledge the step forward that the California Energy Commission took in the recent update to the Title 24 building code to include heat pumps as part of the baseline, we feel it was a missed opportunity to end the expansion of the gas system in new buildings. Perpetuating the use of gas in new buildings for space heat and hot water could cost Californians 1$ billion in unnecessary gas infrastructure and result in an additional 3 million tons of carbon emissions by 2030[48]. By contrast, all-electric new buildings are the lowest-cost opportunity to eliminate emissions, and they avoid the costs of eventually needing to retrofit these buildings in the future. Across nearly all sectors, all-electric new buildings are cheaper to build[49] and reduce carbon with updated technology and a clean electrical grid[50].

B. In what year should sales of gas appliances phase out?

2030.

[48] Denise Grab and Amar Shah, *California Can't Wait on All-Electric New Building Code*, (July 28, 2020), https://rmi.org/california-cant-wait-on-all-electric-new-building-code/
[49] Michael Kenney, Nicholas Janusch, Ingrid Newmann, Mike Jaske, *California Building Decarbonization Assessment- Final Commission Report,* California Energy Commission, (August 2021), pp.82-83.
[50] Sherri Billimoria, Leia Guccione, Mike Henchen, and Leah Louis-Prescott, *The Economics of Electrifying Buildings*, Rocky Mountain Institute (2018), p. 20, available at https://rmi.org/insight/the-economics-of-electrifying-buildings/

Both the Building Decarbonization Coalition's California building decarbonization roadmap,[51] and E3's "Achieving Carbon Neutrality"[52] – Zero Carbon Scenario call for an end to gas appliance sales by 2030. Ensuring new appliances do not extend reliance on the gas system is critical, and a 2030 phase-out date will provide an important signal to building and homeowners, appliance manufacturers, utilities, and HVAC contractors. Invigorating the ecosystem needed to support the transition is essential to make sure that in the intervening years, as many natural replacements as possible shift us from gas to electric appliances. New installations of air conditioning (which is on an increasing trajectory across the State due to higher temperatures and more regular heat waves from global warming) should be heat pumps, which can operate for both heating and cooling, and prime households to shift away from their gas boilers.[53]

C. What percent of existing buildings are retrofitted to all-electric by what year?

Set a schedule that ramps up to achieve near-total electrification of the residential and commercial sector, with an early-focus on strategic gas-system decommissioning.

So far, we are aware of existing building retrofit targets in Netherlands, the United Kingdom, and Germany. Netherlands has a goal of retrofitting 5% of its building stock per year by 2021,[54] the UK has a goal of installing 600,000 heat pumps annually by 2028.[55] California's AB 3232 report lays the foundation for a similar schedule in California.

More important than over-arching percentages of the building stock is where and which buildings are retrofitted. Experts point to the need for strategic trimming of the gas system—a process for retrofitting entire neighborhoods or tranches of buildings based on the branch of the gas distribution system they rely on.[56] This strategy is critical to mitigating overall costs to ratepayers, and offers a path to frontload benefits for communities most in need of upgrade, and protect low-income communities most at risk of being stranded on a gas system with increasing

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[51] *A Roadmap to Decarbonize California Buildings*, Building Decarbonization Coalition, (February, 2019), p.6, available at https://www.buildingdecarb.org/archived/a-roadmap-to-decarbonize-californias-buildings

[52] *Achieving Carbon Neutrality in California: PATHWAYS Scenarios Developed for the California Air Resources Board*, Energy and Environmental Economics, (October, 2020), p.9, https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf

[53] Justin Guay and Nate Adams, "Pacific Northwest heat wave makes the case for incentivizing heat pumps" (June 29, 2021) https://www.canarymedia.com/articles/historic-pacific-northwest-heat-waves-make-the-case-for-making-the-us-a-heat-pump-nation/

[54] Oxford Institute for Energy Studies, "The Great Dutch Gas Transition" (Jul 2019) https://www.oxfordenergy.org/wpcms/wp-content/uploads/2019/07/The-great-Dutch-gas-transition-54.pdf.

[55] UK Parliament, Prime Minister's Plan for 600,000 Heat Pumps – Scrutinised (Nov 20, 2020) https://committees.parliament.uk/committee/62/environmental-audit-committee/news/132793/prime-ministers-plan-for-600000-heat-pumps-scrutinised/

[56] CEC, The Challenge of Retail Gas in California's Low-Carbon Future (Apr. 2020) at 6 https://www.energy.ca.gov/sites/default/files/2021-06/CEC-500-2019-055-F.pdf

costs.[57] Proactive, progressive trimming of the gas system can yield multiple wins—accelerating emission reductions and air quality benefits for low-income customers, decommissioning the leakiest, most costly to upgrade branches of the system, and lowering overall transition costs.[58]

D. Do we keep any fossil gas, RNG, or both?

For the Residential and Commercial sector: No. The low-pressure distribution system should be completely decommissioned.

As E3's Achieving Carbon Neutrality Zero Carbon scenario explains, effective action to achieve efficient and electric buildings will yield complete decommissioning of the low-pressure distribution system. The limited supply of genuinely sustainable biogas should be reserved for industrial gas operations that have no viable path to direct electrification. Squandering this small, expensive supply of sustainable gas in the gas distribution system will hit a dead-end well short of complete decarbonization, and therefore be wasted without altering the need to decommission the system. Moreover, it is unjust to choose decarbonization paths that rely on costly combustion even if it were zero-carbon, since electrification can both lower costs and eliminate health-harming pollutants from combustion.

Conclusion

The energy transformation in California has never been more urgent—accelerating progress is crucial for California to build momentum for climate action globally, and prove to the world that tackling the climate crisis is an opportunity to secure a healthier, more equitable, and more vibrant society. We look forward to working with CARB to create a Scoping Plan that lays out a credible path to that future.

Sincerely,

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[57] Meghan Harwood et al, The Flipside Report: A White Paper on Targeted Geographic Electrification in California's Gas Transition (Jul. 2021) https://www.buildingdecarb.org/uploads/3/0/7/3/30734489/the_flipside_report_-_targeted_electrification_for_gas_transition.pdf.
[58] Id.

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