



Finding the ways that work

June 24, 2022

Ms. Liane Randolph
Chair, California Air Resource Board
1001 I Street
Sacramento, CA 95814

Submitted electronically

Re: Comments on Draft 2022 Climate Change Scoping Plan

Dear Chair Randolph,

On behalf of Environmental Defense Fund (EDF), we appreciate the opportunity to provide comments on the draft 2022 Climate Change Scoping Plan. EDF recognizes and appreciates the significant time and expertise that has gone into this process and draft product by California Air Resources Board (CARB) and partner agency staff, consultants, and the Environmental Justice Advisory Committee (EJAC).

As EDF has pointed out previously in the Scoping Plan process, this decade is a critical time for California, and the world, to dramatically reduce greenhouse gas emissions. Avoiding the worst impacts of climate change will require securing as many reductions as possible as early as possible to stay within the carbon dioxide budgets identified by the Intergovernmental Panel on Climate Change (IPCC) to limit global warming to 1.5°C – a grave milestone that the world could reach as early as 2030.¹ Fortunately, due to decades of climate leadership including at CARB, California already has many of the tools and certainly the opportunity to increase ambition, right now, in addressing climate change.

However, the current draft of the Scoping Plan misses a critical opportunity for greater climate ambition. To meet the rising challenge of climate change, California must demonstrate a higher standard of leadership than is demonstrated in this draft. State leaders must ensure that California's suite of climate policies will not only meet climate goals, but also guarantee that the state's policies will *maximize cuts in emissions in this decade*. **In order to maximize near-term**

¹ Intergovernmental Panel on Climate Change (IPCC), 2018, Global warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, pp. 6, 17.
https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf.

emissions reductions and minimize cumulative build-up of climate pollution, the Scoping Plan should front-load climate ambition so that California can meet or beat the 2030 goal and put the state on track to achieve net-zero emissions no later than 2045.

There are many opportunities for increased ambition throughout this draft Scoping Plan. In order to inform the subsequent draft, this set of comments (1) addresses the economy-wide cap-and-trade program as a tool to ensure near-term greenhouse gas reductions in line with the 2030 goal; (2) discusses the draft Scoping Plan's proposed reference scenario; (3) identifies specific opportunities in the electricity, transportation and natural and working lands sectors for increased climate ambition in the near term; and (4) concludes with important considerations and trade-offs around the significant reliance on emerging technological solutions such as hydrogen, carbon dioxide removal, and carbon capture.

Cap-and-trade can close the emissions gap - if calibrated correctly to ensure climate ambition

California's cap-and-trade program is a nation-leading policy; CARB must ensure that the declining limit on greenhouse gas emissions, alongside numerous other essential emission regulations, provide the greatest level of certainty that the state will meet its 2030 greenhouse gas reduction goal and be on an ambitious path to achieve net-zero greenhouse gas emissions no later than 2045.²

In previous comments, EDF recommended that the Scoping Plan and subsequent analyses evaluate the role that the cap-and-trade program can play to fully close the gap between expected abatement from sectoral policies and the emission cuts necessary to achieve cumulative reductions over the next decade consistent with the state goals.³ The draft Scoping Plan begins to address this issue by anticipating that the cap-and-trade program will "likely play a reduced role" in meeting California's climate goals because of the adoption of additional policies reducing those same greenhouse gas emissions. Specifically, CARB estimates an "approximate 27 percent reduction in the role of the Cap-and-Trade Program in 2030 compared to what was included in the 2017 Scoping Plan update without any consideration of the uncertainty factor."⁴

The fact that California has enacted more sectoral policies to cut climate pollution is a promising sign of further action on climate change. At the same time, the draft Scoping Plan notes that estimated abatement from non-cap-and-trade policies is subject to uncertainty factors (such as the rate of deployment of clean technologies and fuels) that may impact their ability to achieve anticipated greenhouse gas emission reductions, and references a forthcoming analysis to quantify such factors. This uncertainty is exactly what makes the emissions cap so critical to the success of

² A full discussion of ambition in the cap-and-trade program is included in EDF's July 9, 2021 Scoping Plan comments. https://www.arb.ca.gov/lispub/comm2/bccomdisp.php?listname=sp22-kickoff-ws&comment_num=144&virt_num=103

³ Environmental Defense Fund, April 4, 2022 Scoping Plan modeling results comments. <https://www.arb.ca.gov/lists/com-attach/47-sp22-modelresults-ws-B3RdOFc5BCdSPQhm.pdf>

⁴ California Air Resources Board, Draft 2022 Scoping Plan Update, pg 91. <https://www2.arb.ca.gov/sites/default/files/2022-05/2022-draft-sp.pdf>

California's climate goals; the best way to mitigate uncertainty is with a firm, declining cap on emissions which is in line with the state's emissions targets.

Emissions cap must be aligned with 2030 emission reduction goal

It is not inherently a problem if the cap-and-trade program plays a smaller role in achieving greenhouse gas reduction goals. **The more important question is whether or not the cap, the most important part of the cap-and-trade program, is calibrated correctly to achieve the goal.** When well-designed, a firm, declining cap on emissions provides the greatest possible certainty of meeting greenhouse gas reduction targets. This pollution limit, set by the emissions budget for covered sources, is the most essential feature of the cap-and-trade program. The relative role of the cap-and-trade program compared to sector-based policies as the "primary driver" for emission reductions is less important than the role the cap plays in ensuring that emissions do not exceed the allotted budget, and the stringency of the budget itself. The cap should act as the backstop to keep California on track to its climate goals. If other programs help achieve greater reductions than expected then there is less pressure on the cap; but if other programs deliver fewer reductions, the cap remains the state's "insurance policy" to make sure emissions continue to decline at the pace required.

To function effectively as the backstop, the budget from 2021 to 2030 must be calibrated to ensure that cumulative emissions in California, at a minimum, do not exceed emissions allowed under a linear trajectory from 2020 to 2030 targets, factoring in any previously "banked" allowances that may be retired for compliance in the upcoming years. Moreover, CARB should use the emissions projections developed for all California emissions sources — including sectors outside the cap — to ensure that the allowance budget in the cap-and-trade program is stringent enough to accommodate any potential growth in emissions from uncapped sectors and still secure the cumulative reductions necessary. In other words, if an increase is projected in uncapped sectors even given any existing or likely future complementary policies, the budget should be reduced in order to ensure the capped sectors overperform and reduce additional emissions to accommodate any projected increase in uncapped sectors.

Rulemaking is necessary to ensure sufficient ambition in cap and trade

While EDF recognizes that the Scoping Plan is not the venue for actually making adjustments to the emissions cap, the draft Plan should clearly articulate an intention to examine the stringency of the emissions cap in a formal rulemaking proceeding as soon as possible. EDF recommends that this rule-making process commence no later than Q1 2023 with any regulatory changes to be implemented by January 1, 2024. Any delay makes it more challenging to change course - in policy or compliance - as needed before 2030.

Explore design features to guarantee reductions in overburdened communities

Lastly, while a more detailed discussion of cap calibration and design features to enhance program ambition is available in EDF's July 9, 2021 Scoping Plan comments,⁵ we want to highlight the recommendation from the EJAC to explore "no trade zones" as a strategy to reduce conventional air pollution in overburdened communities alongside the reduction in global climate pollution. In 2021, EDF filed a regulatory petition with the Colorado Air Quality Control Commission which included inflexible, source-specific greenhouse gas pollution limits for facilities that directly contribute to disproportionate pollution burdens.⁶ For those sources, the program was designed to limit compliance flexibility such that pollution reductions and health benefits accrue directly in the communities where environmental injustices are most acute. EDF encourages CARB to study these provisions and consider how further greenhouse gas requirements for specific sources may reduce locally harmful pollutants in overburdened communities, including how such provisions could be adapted for the California context and incorporated into the cap-and-trade program.

- The draft Scoping Plan should provide analysis on the stringency of the emissions cap vis-a-vis the 2030 statutory target.
- CARB should initiate a cap-and-trade rulemaking to start Q1 2023 to ensure the cap-and-trade program is sufficiently ambitious to be the emissions backstop and close the gap between expected non-cap-and-trade abatement and the 2030 statutory goal.
- As part of the recommended 2023 cap-and-trade rulemaking, CARB should carefully consider EJAC recommendations regarding the cap-and-trade program. Specifically, CARB should explore additional program design options to ensure that pollution is reduced from sources in overburdened communities.

Scoping Plan needs greater clarity in reference scenario assumptions

The basis for CARB's updated reference scenario included in the draft Scoping Plan requires significant clarification. For the draft Plan, CARB is relying on a new reference scenario that contains significant deviations from the official GHG Inventory data for historic years and preliminary estimates for recent years.⁷ For example, CARB's preliminary emissions estimate for 2021 is 409.1 MMT CO₂e +/- 24.4 (creating a range of 384.7 to 433.5 MMT CO₂e for that year).

⁵ Environmental Defense Fund, July 9, 2021 Scoping Plan comments.

[https://www.arb.ca.gov/lispub/comm2/bccomdisp.php?listname=sp22-kickoff-
ws&comment_num=144&virt_num=103](https://www.arb.ca.gov/lispub/comm2/bccomdisp.php?listname=sp22-kickoff-ws&comment_num=144&virt_num=103)

⁶ Environmental Defense Fund, Petition to Colorado Air Quality Control Commission

https://www.edf.org/sites/default/files/documents/Proposed%20Amendments%20to%20Regulation%202%20Text%20and%20SBAP_0.pdf

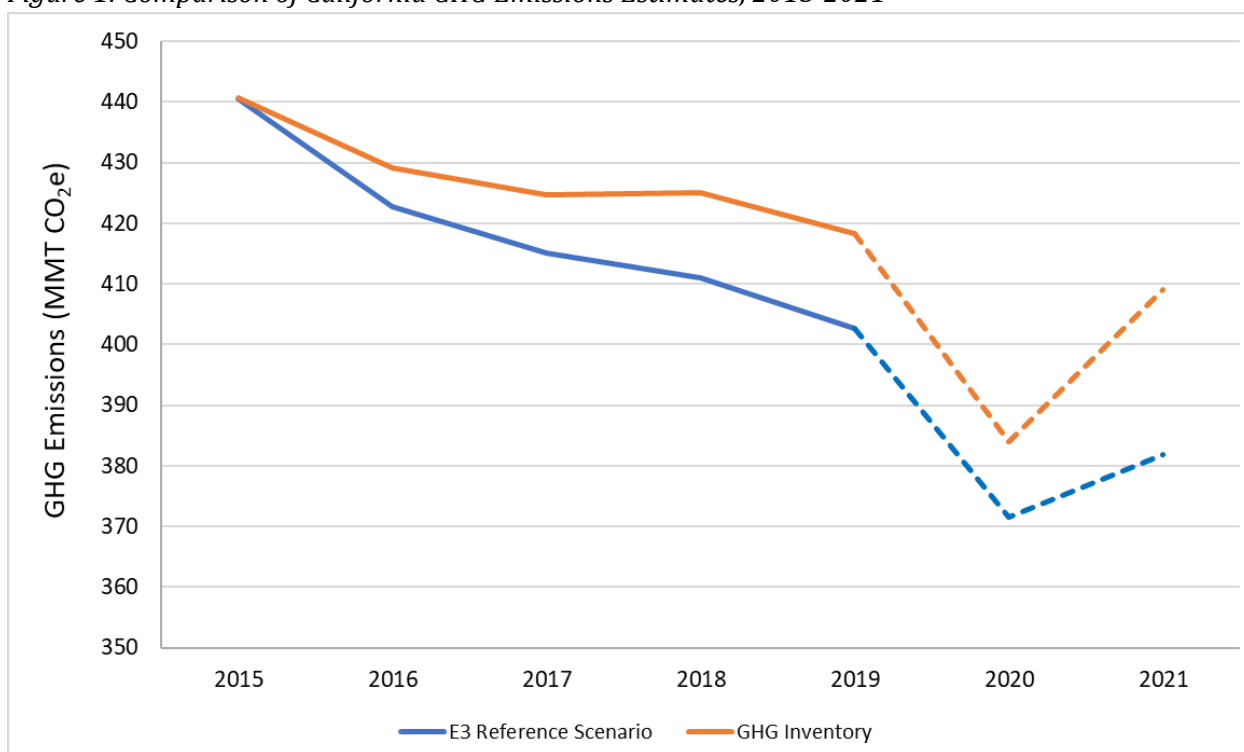
⁷ California Air Resources Board, Preliminary Estimates of California's 2020 and 2021 Greenhouse Gas Emissions [https://ww2.arb.ca.gov/sites/default/files/2022-
04/2021%20GHG%20Estimates%20Report%20for%20Item%203900-001-3237%20-%20Remediated.pdf](https://ww2.arb.ca.gov/sites/default/files/2022-04/2021%20GHG%20Estimates%20Report%20for%20Item%203900-001-3237%20-%20Remediated.pdf)

and California Greenhouse Gas Emissions for 2000 to 2019 https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000_2019_ghg_inventory_trends_20220516.pdf

However, in the Scoping Plan Reference Scenario, CARB estimates the 2021 level at 381.8 MMT CO₂e. CARB is clear in their reporting that the 2021 data is an estimate not to be used for policymaking. However, it appears that E3's reference scenario estimate for 2021 falls below the lower bound of CARB's uncertainty range for the same year, and there is no clear reason stated why such an optimistic estimate was chosen for the modeling in the draft Scoping Plan. The difference between the Scoping Plan and reported data is not negligible - approximately 27 MMT CO₂e in 2021 (with the full range of the discrepancy between 2.9 and 51.7 MMT CO₂e, depending on uncertainty in CARB's preliminary estimates).

Moreover, the graph below shows that E3's emission estimates for historic years are consistently lower than the state's official GHG Inventory estimates. For example, in 2019, the inventory reports total gross emissions at a level of 15.5 MMT CO₂e higher than the data in E3's reference scenario.

Figure 1: Comparison of California GHG Emissions Estimates, 2015-2021



CARB has not provided a sufficient explanation for these differences. It is critical that the baseline used in the Scoping Plan reflects reality and uses the most accurate and reliable data available. Any discrepancy between the official inventory or reported data and the data modeled by E3 must be evaluated to inform robust and accurate emissions projections. This is crucial not only for the success of the Scoping Plan itself, but also for the Scoping Plan's future usage as a basis for later rulemakings. Unclear or inconsistent data in this Plan can have significant repercussions on the efficacy of future policies to tackle climate change in California and could even jeopardize the state's ability to meet its own targets.

Clear decarbonization goals for electricity generation are imperative

The draft Scoping Plan rightly notes that a “clean, affordable, and reliable electricity grid will serve as the backbone to support deep decarbonization across California’s economy.”⁸ However, to realize this vision, CARB needs to increase its ambition in the electricity sector. Specifically, **the draft Scoping Plan should clearly set a goal of zero emissions from electricity generation no later than 2045 with direction for planning agencies to establish interim targets and front-loaded actions to measure that progress.** This is not only necessary for California to meet its emission reduction requirements; achieving zero emissions by 2045 can be done both affordably and reliably and sending this signal as soon as possible will help create the right market incentives to decarbonize the grid.

A zero-emission grid by 2045 is necessary to meet climate goals

Reductions from the power sector are not only critical for reaching California’s 2030 and 2045 climate goals, but they also help unlock reductions in other sectors like transportation and buildings by allowing these sectors to increasingly rely on clean electricity. California must achieve a clean grid to achieve any of its climate targets, including in the buildings and transportation sectors, which means zero-emission generation in addition to zero-emission sales as mandated under SB 100. At the same time, CARB needs to set ambitious interim targets to ensure that the state is maximizing the emission reduction opportunity from the electricity sector in the current decade. For instance, we encourage CARB to explore a target of 30MMT CO₂ emissions no later than 2030.

Clearly setting a 2045 zero-emission goal coupled with aggressive interim goals is essential as the state seeks to build a significant amount of needed electricity infrastructure in the coming years. In prior Scoping Plans, CARB established an overall target for emission reductions in the electricity sector and then the state’s integrated resource planning (IRP) process determined the right mix of electric generation to achieve that target. The draft 2022 Scoping Plan draft falls significantly short of setting clear electricity generation goals for the IRP process to follow, which is especially problematic as California needs to be making record-breaking clean energy investments.

It is also timely for CARB to clearly set this 2045 goal alongside interim goals because it takes a significant amount of lead time and extensive planning to build electricity infrastructure. Determining the necessary new transmission capacity, permitting, and land use requirements for new generation can be a lengthy but necessary process. As such, clearly articulating as soon as possible the need and expectation of achieving zero-carbon electricity generation no later than 2045 will support the necessary long-term planning. Early investments in additional clean and renewable resources are lower risk and lower cost than investments in additional GHG-emitting resources or even later investments in clean resources. By clearly articulating a 2045 target, the draft Plan will help put California on track to its climate goals.

⁸ California Air Resources Board, Draft 2022 Scoping Plan Update, pg 156.
<https://ww2.arb.ca.gov/sites/default/files/2022-05/2022-draft-sp.pdf>

A zero-emission grid can be achieved both affordably and reliably

Modeling from EDF shows that California can fully eliminate electric sector GHG emissions by 2045 in an affordable and reliable manner. Knowing that large sectors of the economy will electrify during this time period, including transportation and buildings, California should prepare to decarbonize both the existing grid and a major build out of new generation resources.

EDF's Clean Firm Power Modeling found that, with the right mix of renewable and clean firm power resources, generation and transmission costs for California's decarbonized electric grid will be the same—if not less—than current costs.⁹ Using three different optimization models, EDF and its research partners concluded that many combinations of clean firm power can deliver a reliable carbon-free electricity supply by 2045 at costs that total about 7-10 cents per kilowatt hour.¹⁰ This cost is approximately the same—if not less— than the current average generation and transmission costs for the State's investor-owned utilities.¹¹

- The Scoping Plan should clearly commit to 100% zero-carbon electricity generation no later than 2045, with guidance to partner agencies to set interim targets that increase emission reductions in the near-term and support the development of clean firm power resources that require long lead times.
- Given the significant amount of land required for power generation, the draft Scoping Plan should estimate the land available for such uses and give guidance to partner agencies on how to responsibly expedite permitting on that land, including better inter-agency coordination.

Additional analysis and metrics regarding affordability are required

As the Independent Emissions Market Advisory Committee recommended in their 2021 report, CARB should conduct an analysis of affordability impacts of decarbonization, specifically with respect to the electricity sector and rural, low-income, and historically overburdened communities.¹² As electricity demand increases to drive economy-wide decarbonization, and more transmission infrastructure is needed to deliver that electricity, it will be **essential to ensure that the cost burden is not felt disproportionately by communities and households least able to**

⁹ Long, JCS et al: "California needs clean firm power, and so does the rest of the world: Three detailed models of the future of California's power system all show that California needs carbon-free electricity sources that don't depend on the weather."

<https://www.edf.org/sites/default/files/documents/SB100%20clean%20firm%20power%20report%20plus%20SI.pdf>

¹⁰ Environmental Defense Fund, Reply Comments on Mid-Term Reliability Analysis and Proposed Procurement. <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M376/K743/376743406.PDF>

¹¹ Long et al: "California needs clean firm power, and so does the rest of the world."

<https://www.edf.org/sites/default/files/documents/SB100%20clean%20firm%20power%20report%20plus%20SI.pdf>

¹² California Environmental Protection Agency: 2021 Annual Report of the Independent Emissions Market Advisory Committee, pg 11. <https://calepa.ca.gov/wp-content/uploads/sites/6/2022/01/2021-IEMAC-Annual-Report.a.pdf>

absorb that cost and who have often enjoyed fewer benefits and more burdens from the energy transition.

Unfortunately, doing the analysis recommended by IEMAC in a way that provides meaningful insights may be hampered by the lack of specific policy options presented in the proposed scenario. As IEMAC noted, “technology outcomes alone do not determine the distribution of costs and benefits to Californians; instead, affordability impacts depend on the policy design. To help understand “who pays,” it needs to be clear which policies are being relied upon to get California to its climate goals.”¹³

“Energy burden” is an essential equity metric

While most of the affordability considerations in the draft Scoping Plan are focused on housing, affordability is often also measured by either electric rate or electric bill. Both are imperfect options for this situation. Major new portions of the economy will be electrified as part of the state’s decarbonization transition, which means that total energy usage will increase. The better metric to use in the recommended affordability analysis is “energy burden.” Energy burden measures the percentage of household budget allocated to energy products such as electricity, and energy burden can also capture non-energy benefits, such as reduced spend on health care costs from less exposure to local air pollution in aggregate. CARB should consider metrics to measure affordability that align with the policy objectives in the other parts of the Scoping Plan. Energy burden may require customer segmentation to ensure that the impacts to the state’s most vulnerable populations are not obscured by an “average” customer cost shift. However, the state already has the ability to evaluate economic segments of the population.

CARB should also consider the bill impacts on both electric and gas customers during the transition. If the state does not engage in some form of targeted geographic electrification, then only prioritizing low-income households will be insufficient. The goal is to lower total customer revenue requirements by treating electrification as a “non-pipeline” alternative. If there is not some form of geographic electrification targeting, then California will require the same amount of total infrastructure but spread out across fewer customers, meaning that their bills will only increase. The state may need to explore innovative sources of funds to help offset this cost shift, including securitization of existing assets or leveraging non-ratepayer funds to keep bills affordable during the transition. EDF outlined many of these strategies in a 2019 white paper entitled “Managing the Transition.”¹⁴

- The revised Scoping Plan should include robust affordability analysis of electricity transition in low-income, rural, and tribal communities.
- A greater focus on the impacts on vulnerable frontline populations and those living in disadvantaged communities is necessary, including utilizing the energy burden metric in the Scoping Plan and subsequent planning processes.

¹³ Ibid.

¹⁴ Environmental Defense Fund: “Managing the Transition: Proactive Solutions for Stranded Asset Gas Risk in California.” <http://www.edf.org/strandedassets>

There is opportunity for more ambition from medium- and heavy-duty transportation

The 2022 Scoping Plan is a significant opportunity for California to reassess its methods for reducing climate and air pollution from the transportation sector. Statewide, about 12 million Californians live in communities that exceed the federal ozone or PM2.5 standards.¹⁵ Fossil fuel-centric transportation generates over 40% of the state's climate pollution, and is the state's largest producer of health-harming nitrogen oxide (NO_x) emissions and toxic diesel particulate pollution.¹⁶ To achieve the state's goal of 100% zero-emission medium- and heavy-duty vehicles on the road by 2045 everywhere feasible^{17,18} and chart an equity-focused path toward achieving net-zero greenhouse gas emissions, **the 2022 Scoping Plan must rapidly eliminate emissions from the transportation sector, including by ensuring 100% zero-emission medium- and heavy duty (MHD) vehicle sales by 2035.**

Need for an ambitious path to a zero-emission transportation sector

Transportation pollution is endemic in California, particularly from MHD vehicles, and must be addressed with a set of solutions that appropriately recognize the significant and disproportionate impacts of these vehicles. While MHD vehicles make up just 6% of vehicles on the road in California, they produce 72% of the state's health-harming NO_x emissions and 21% of climate change-causing GHG emissions from the on-road transportation sector.¹⁹ Furthermore, EDF researchers found that communities of color are far more burdened by this pollution than white communities. For example, up to 1 in 2 new childhood cases of asthma in West and Downtown Oakland, where more than 70% of the population are people of color, were caused by traffic-related air pollution while that number was about 1 in 5 for children in an Oakland Hills neighborhood, where more than 70% of the population is white.²⁰

This points to the need for a Scoping Plan that provides a clear pathway to progress, but this draft Plan fails to set CARB on a path to develop MHD regulations that reach 100% MHD zero-emission vehicles (ZEVs) on the road by 2045 everywhere feasible and for all drayage trucks to be zero-

¹⁵ California Air Resources Board, Heavy-Duty Low Nox Program Public Workshop, January 23, 2019, page 4. https://ww2.arb.ca.gov/sites/default/files/classic/msprog/hdlownox/files/workgroup_20190123/00-background_&_timing_ws01232019.pdf?_ga=2.124115660.717209197.1572561203-1119335516.1567614494

¹⁶ California Air Resources Board, Current California GHG Emission Inventory Data. <https://ww2.arb.ca.gov/ghg-inventory-data>

¹⁷ California Air Resources Board, Draft 2022 Scoping Plan Update. <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>

¹⁸ Office of the Governor, Executive Order N-79-20, September 23 2020. <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>

¹⁹ California Air Resources Board, 2020 Mobile Source Strategy, October 28, 2021, page 130. https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf

²⁰ Environmental Defense Fund, "Air pollution's unequal impacts in the Bay Area" March 31, 2021. <https://www.edf.org/airqualitymaps/oakland/health-disparities>

emission by 2035, as described in Governor Newsom's recent executive order (EO).²¹ The draft Plan's expectation of 100% MHD ZEV sales by 2040, rather than 2035 as EDF recommends, will not inspire the level of turnover from MHD fossil fuel vehicles to MHD ZEVs needed to meet the Governor's EO. Under the draft Plan's proposed 2040 sales goal, CARB's own analysis shows that half the MHD vehicle population on the road will still be fossil fuel-powered in 2045.²²

To address this unacceptable shortfall, CARB must set a more ambitious 100% by 2035 MHD ZEV sales requirement. CARB's own analysis and the latest technology reports indicate a 100% sales requirement for MHD ZEVs is feasible and cost effective.²³ A recent report shows that MHD ZEVs will become less expensive to purchase and operate than their combustion engine counterparts by 2027.²⁴

The draft Plan should not preclude ambition of future rules

The draft Scoping Plan appears to anticipate CARB taking an insufficiently ambitious approach in the Advanced Clean Fleets (ACF) rulemaking process.²⁵ The draft Plan appears to be limiting what can be achieved by the ACF rule, which has yet to be adopted, by saying that it (and any future strengthening of the Advanced Clean Trucks (ACT) rule) should align invariably with the Scoping Plan.²⁶ The final Scoping Plan certainly should not limit CARB's ambition -- to the contrary, CARB should use the Plan to provide for more rapid action in its MHD ZEV rules. Thus, the Scoping Plan should require 100% MHD ZEV sales by 2035 or, at minimum, more clearly encourage individual rules to go further than it envisions to the extent feasible, which ultimately will be determined in individual regulatory proceedings.

Leverage existing financing mechanisms to fund the transition

The draft Scoping Plan highlights the importance of funding for small businesses and pollution-burdened communities, which is critical, but lacks detail. In particular, the draft Plan should fully integrate the innovative financing mechanisms established under SB 372 (Leyva, 2021).²⁷ SB 372 gives CARB the authority to set up a broad array of financing tools and other support mechanisms

²¹ Office of the Governor, Executive Order N-79-20, September, 23, 2020. <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>

²² California Air Resources Board, Proposed Advanced Clean Fleets (ACF) Regulation Workshop, May 2, 2022, page 58. https://ww2.arb.ca.gov/sites/default/files/2022-04/220502acfpres_ADA.pdf

²³ California Air Resources Board, 2020 Mobile Source Strategy, October 28, 2021, pages 130-135. https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf

²⁴ Environmental Defense Fund, "New Study Finds Rapidly Declining Costs for Zero-Emitting Freight Trucks and Buses" February 10, 2022. <https://www.edf.org/media/new-study-finds-rapidly-declining-costs-zero-emitting-freight-trucks-and-buses>

²⁵ California Air Resources Board, Advanced Clean Fleets. <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets/about>

²⁶ Ibid.

²⁷ Environmental Defense Fund, "New bill will make it easier, cheaper to buy electric trucks and buses," April 22, 2021. <https://blogs.edf.org/energyexchange/2021/04/22/new-bill-will-make-it-easier-cheaper-to-buy-electric-trucks-and-buses/>

to meet the needs of diverse fleets acquiring ZEV trucks, with 75% of funds going to underserved communities. When applicable, these programs are designed to draw in private capital to help cover a greater portion of the transition than the state can alone, for example by utilizing tools that attract private financing to larger fleets and using more direct public funding for smaller fleets. We recommend incorporating the provisions of SB 372 in the Scoping Plan to support small truckers and enable larger trucking fleets to play a role in financing the solution.

Strong ZEV standards are good for the economy

While enhancing health and climate benefits are critical reasons for strengthening the MHD ZEV provisions in the draft Scoping Plan, ZEV regulations are also good for the economy. CARB has estimated the ACT will yield almost \$6 billion in direct savings for the trucking industry -- these economic benefits were corroborated by Energy Innovation analysis.²⁸ These direct savings accrue mostly from lower fueling and maintenance costs due to the switch away from fossil fuel-powered engines, with total cost of ownership savings more than compensating for higher upfront vehicle and infrastructure costs.

Installing electric truck charging infrastructure will also put thousands of people to work in the early years of the rule and support local ZEV manufacturers.²⁹ These direct economic benefits are in addition to indirect economic benefits of nearly \$9 billion in California from 2020 through 2040 related to avoided health impacts, according to CARB staff's analysis.³⁰

Zero-emission trucks are ready

There are already many zero-emission options for a wide array of truck fleets, years before 2035. The number of models available is rapidly growing – expanding by 26% over the past two years.³¹ Fleets large and small are embracing these vehicles. EDF has identified over 180 fleets that are operating at least one MHD ZEV today or have one on order.³² Even in this stage of development, these trucks are demonstrating that they are up to the job. A recent report says that half of heavy-

²⁸ Energy Innovation, “Clean Trucks, Big Bucks” June 2020, page 17. https://energyinnovation.org/wp-content/uploads/2020/06/Clean-Trucks-Big-Bucks_June_17_2020.pdf

²⁹ Environmental Defense Fund, Medium and Heavy Duty Zero Emissions Vehicle Supply Chain Analysis, June 2021. https://business.edf.org/files/National-Profile-6.29.pdf?gl=1*1rook2d*ga*MTg1MDEyMjY0Ni4xNjMxNTY5OTE3*ga_2B3856Y9QW*MTY1NTI0MzUzMS4zMS4xLjE2NTUyNDM3NDguNTk.*ga_WE3BPRQKW0*MTY1NTI0MzUzMS45NS4xLjE2NTUyNDM3NDguNTk.*ga_Q5CTTQBjD8*MTY1NTI0MzUzMS4zMS4xLjE2NTUyNDM3NDguNTk

³⁰ California Air Resources Board, Updated Costs and Benefits Analysis for the Proposed Advanced Clean Trucks Regulation, 2019, page 7. <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/30dayattc.pdf>

³¹ CALSTART, “New data tracks 26% growth of zero-emission truck and bus model availability globally in midst of economic, supply chain challenges.” <https://calstart.org/new-data-tracks-growth-of-zero-emission-truck-and-bus-model-availability-globally-in-midst-of-economic-supply-chain-challenges/>

³² Environmental Defense Fund, EDF-Electric Fleet Deployment & Commitment List. https://docs.google.com/spreadsheets/d/1l0m2Do1mjSemrb_DT40YNGou4o2m2Ee-KLSvHC-5vAc/edit#gid=2049738669

duty regional haul tractors are electrifiable today.³³ This will rapidly grow as more and more vehicles capable of all use cases are produced in the coming years; despite near-term supply chain shortages, significant growth in availability is expected over the next 13 years. The vehicle availability indicates that the market is ready for significant MHD ZEV deployment, and the Scoping Plan should give the guidance and commitment to the market to increase the ambition.

EDF appreciates the draft Scoping Plan's focus on transportation -- especially its focus on ZEVs and interagency coordination. California is carving a pathway that is unique, but its success depends on CARB's commitment to clean and cost-saving MHD ZEV trucks.

- The Scoping Plan must set an ambitious but achievable target of 100% MHD ZEV sales by 2035, a recommendation also made by the EJAC.³⁴
- Innovative financing mechanisms like those established under SB 372 should be clearly articulated in the Scoping Plan, which will enable California to achieve 100% MHD ZEVs on the road by 2045.

Focus on natural climate solutions is commendable: the pace and scale can be more ambitious

EDF applauds CARB and state partners for the explicit focus on natural climate solutions (NCS) in the draft Scoping Plan. This focus and the commitment by the state in recent years demonstrates California's global leadership on climate action. This commitment is especially laudable in the face of the growing reality that the underlying climate in California is changing with unpredictable effects on ecosystem response. **As much as the draft Scoping Plan lays out a vision for a more fulsome role for natural and working lands, EDF encourages CARB and state partners to use this Plan as a launching pad for much more specific and actionable regional plans to prioritize and greatly increase the pace and scale of NCS across the state.**

CARB and state partners should use the publication of the final Scoping Plan at the end of 2022 as the trigger for development of more specific and actionable regional strategies that help public, private, and tribal land managers promote NCS and increase opportunities for collaboration. The Natural Resources Agency started this process in Section 4 of its Natural and Working Lands Climate Smart Strategy report.³⁵ In these same regions, the State should commission agency, university, NGO, and other partners to envision a roll out of NCS at scale with a focus on those general strategies identified in the Scoping Plan that contribute to climate benefit. Because implementation of NCS is highly dependent on ecosystem status, vegetation type, community

³³ North American Council for Freight Efficiency, "Half of Heavy-Duty Regional Haul Tractors Are Electrifiable Now, Study Finds," May 5, 2022. <https://nacfe.org/news/half-of-heavy-duty-regional-haul-tractors-are-electrifiable-now-study-finds/>

³⁴ California Air Resources Board, Preliminary Draft of EJAC Recommendations, pg 12. https://ww2.arb.ca.gov/sites/default/files/2022-04/EJAC%20Workgroup%20DRAFT%20Recommendations_4_1_22.pdf

³⁵ Natural and Working Lands Climate Smart Strategy. https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/CNRA-Report-2022---Final_Accessible_Compressed.pdf

dynamics and other factors, and because California is such a large and diverse state, this type of regional specificity is essential.

The availability of regional plans creates the opportunity to improve quantification of climate benefits and could help stimulate greater investment in NCS. The ability to credibly measure the quantity of climate benefit delivered by a strategy improves investor confidence, whether that investor is a private company seeking to meet net-zero targets or a public agency allocating public resources.³⁶ It will also allow deployment of strategies at a scale relevant to the environmental problems that we confront in California. We offer as a model the roll out of the LEAF Coalition, an effort to deploy over \$1 billion in public and private resources to tropical forest NCS.³⁷ LEAF investors are each seeking to scale up climate ambition, particularly in natural systems, by pooling resources in large regions (in this case states and provinces) and catalyzing implementation of policies and programs that bend the curve on GHG emissions at that same scale. EDF encourages CARB and partner agencies to lean in on similar approaches as it seeks to both meet its climate ambition and address pressing natural resources problems, especially catastrophic wildlife.

Land managers, particularly forest land managers across the state are increasingly finding that their capacity to implement NCS in their region is constrained by lack of human capacity and infrastructure to accomplish the land and vegetation management strategies that are essential to meet the goals of the draft Scoping Plan. To that end, each regional plan should include elements to build capacity and infrastructure that would allow cost effective deployment of NCS. The State Board of Forestry and Fire Protection has taken important steps in this direction with several products from the Joint Institute for Wood Products Innovation.³⁸ Similarly, the Governor's Forest Resilience Task Force is moving forward on complementary strategies. And yet, more needs to be done to move recommendations forward and to tie this capacity and infrastructure development to regional NCS plans. The Scoping Plan is an important opportunity to support and catalyze this needed regional planning.

- The draft Scoping Plan should be used to catalyze development of more specific and actionable regional strategies that help land managers promote natural climate solutions and increase opportunities for collaboration, including elements to build capacity and infrastructure.

Hydrogen is a potential climate solution in hard-to-decarbonize sectors - but only if leaks are accounted for and prevented

The draft Scoping Plan relies on a significant increase in hydrogen production and deployment, which has the potential to be an important climate strategy. **Scaling up the use of hydrogen to**

³⁶ Schwartzman, S. et al.: Environmental integrity of emissions reductions depends on scale and systemic changes, not sector of origin, Environ. Res. Lett. 16 091001.

<https://iopscience.iop.org/article/10.1088/1748-9326/ac18e8/pdf>

³⁷ LEAF Coalition: Lowering Emissions by Accelerating Forest finance. <https://leafcoalition.org/>

³⁸ Joint Institute for Wood Product Innovation. <https://bof.fire.ca.gov/board-committees/joint-institute-for-wood-products-innovation/>

decarbonize heavy-duty transportation, aviation, shipping, or certain industrial applications requires careful consideration of hydrogen’s environmental and climate impacts, which recent EDF research finds have historically been underestimated.³⁹

There is emerging consensus among the scientific community on hydrogen’s warming impact as a powerful short-lived indirect greenhouse gas. Specifically, it is over 30 times more potent than an equal amount of carbon dioxide emissions over a 20-year period, which is three times higher than its impact over a 100 year period. Hydrogen should be measured, including in modeling underpinning the draft Scoping Plan, using both a global warming potential (GWP) 20 and GWP100 in order to accurately capture the impact of hydrogen emissions (including leakage and venting) in the near- and long-term. When considering near-term climate impacts, soon-to-be published EDF research shows that climate benefits from hydrogen usage can be severely diminished for moderate to high emissions rates (around 5 to 10%). Minimizing or eliminating hydrogen leakage is absolutely critical to the success of hydrogen as part of the solution to climate change.

Not all hydrogen is green nor a climate solution

The draft Scoping Plan fails to sufficiently explain which types of hydrogen would be acceptable for California’s decarbonization pathway. Specifically, In the March 15, 2022 Scoping Plan workshop, CARB stated that it would only pursue zero-carbon hydrogen produced through renewable energy (‘green’ hydrogen), or through feedstocks paired with CCS (‘blue’ hydrogen). In the May 2022 draft, CARB further stated that “for the purposes of the Draft 2022 Scoping Plan, ‘green hydrogen’ is not limited to only electrolytic hydrogen produced from renewables.” This is a counterintuitive definition, since the broadly understood definition of ‘green hydrogen’ is limited to renewable-powered electrolytic hydrogen.

CARB should revise its use of ‘green hydrogen’ in the draft Scoping Plan to avoid this misleading characterization, and instead clearly state whether its intended buildout of hydrogen will rely on fossil power with carbon capture or not. **Because the climate impacts of this type of hydrogen production are potentially significant, fossil generated hydrogen should not be considered a climate solution in this Scoping Plan.**

The extent to which hydrogen will be renewable-generated is also a crucial question when considering the viability of the proposed scenario, which is modeled *assuming off-grid buildout* of the needed renewable energy. However, this is a very ambitious, if laudable, assumption and casts doubt on whether the projected emissions reductions contained in its proposed scenario are realistic.

While EDF appreciates the emphasis placed on hydrogen produced through renewable energy in the draft Scoping Plan, hydrogen produced through feedstocks paired with CCS is also contemplated and brings additional climate impacts. EDF’s findings point out that carbon dioxide is not the only important climate pollutant produced through the hydrogen generation process,

³⁹ Ocko, I. B. and Hamburg, S. P.: Climate consequences of hydrogen emissions, Atmos. Chem. Phys. in press, 2022.

especially when not produced with renewable energy; methane can also be released at significant levels in addition to hydrogen emissions, contributing to the overall climate warming effects of fossil fuel-based hydrogen.

Specifically, methane leakage from producing hydrogen using natural gas and CCS technologies is of significant concern; the climate effects of methane leakage are often underestimated in hydrogen assessments, and methane is a powerful greenhouse gas with high global warming potential. As stated in the draft Scoping Plan, “hydrogen can be produced through electrolysis with renewable electricity or through steam methane reformation of renewable or fossil gas. If steam methane reformation is paired with CCS, the hydrogen produced could potentially be zero carbon.”⁴⁰ This language is not sufficiently stringent to ensure that any hydrogen produced *is* zero carbon, and it does not address the issue of methane leakage which is critical to prevent when developing any potential hydrogen production using any feedstocks with CCS. The level of climate harm only increases if there is embedded carbon in the lifecycle analysis of hydrogen. To that end, **EDF suggests that the Scoping Plan only assumes hydrogen from renewable energy generation.**

Hydrogen has potential only in hard-to-decarbonize sectors

Across all methods of hydrogen production, leak monitoring and minimization is of utmost importance and should be of primary concern for any hydrogen buildout in California. Given the risks of a rapid, large-scale buildout of hydrogen production, hydrogen should be prioritized only for hard-to-decarbonize industrial sectors such as steel and cement manufacturing, or as an alternative fuel for shipping and aviation. Zero carbon hydrogen could help be a part of the transition to a clean energy future, but California must ensure that its buildout will not add to the climate crisis by failing to recognize and monitor its role as an indirect greenhouse gas.

Unfortunately, the draft Scoping Plan also expects to deploy hydrogen in light-duty passenger vehicles. EDF analysis shows that using green hydrogen in passenger vehicles would require much greater quantities of renewable energy - perhaps as much as 2 to 5 times as much renewable energy - than direct electrification of light duty transportation.⁴¹ This “energy penalty” is even more significant for home heating. It is far more efficient to use renewable energy to electrify vehicles and heat homes than to use renewable energy to produce hydrogen.

As the hydrogen industry is in its infancy, California has an opportunity to ensure that the accelerating investment in hydrogen projects yields the climate benefits being sought in the near-term, and thereby avoid needing to make major retrofits down the road or even abandon large capital investments that do not turn out to be climate solutions. To truly be among the strategies to address climate change, hydrogen production must be approached with robust monitoring and leading technology to catch and prevent any leakage, rely only on renewable generation, be applied only for hard-to-decarbonize end uses, and with stringent measures in place to account for and prevent the leakage risk not only of hydrogen itself.

⁴⁰ California Air Resources Board, Draft 2022 Scoping Plan Update, pg 69.
<https://ww2.arb.ca.gov/sites/default/files/2022-05/2022-draft-sp.pdf>

⁴¹ Internal EDF analysis.

- Assumptions about future hydrogen infrastructure must include robust leak detection and monitoring to prevent or swiftly repair leaks of *any* size.
- Hydrogen projects anticipated by the Scoping Plan must include strategies to prevent leakage, including minimizing transportation.
- To be a climate solution, hydrogen projects must account for the full climate impact of upstream emissions as well as of the hydrogen itself as an indirect, short-lived greenhouse gas. To that end, EDF would echo the recommendation of the EJAC to do a full lifecycle analysis of emissions from, among other strategies, hydrogen production.⁴²
- Hydrogen should be measured, including in modeling underpinning the draft Scoping Plan, using both a global warming potential (GWP) 20 and GWP100 in order to accurately capture the impact of hydrogen emissions (including leakage and venting) in the near- and long-term.
- The Scoping Plan should clarify its definitions of different types of hydrogen to be consistent with broadly accepted definitions, and CARB should clearly state if they intend to use fossil gas with carbon capture as a feedstock for hydrogen production.
- The Scoping Plan should assume only hydrogen produced through renewable energy to avoid potentially significant upstream emissions, in line with EJAC recommendations.
- Hydrogen should only be considered a climate solution for hard-to-decarbonize sectors, not applications which can easily be electrified, including light-duty vehicles.

Greenhouse gas removal strategies are not a substitute for emission reductions

To achieve economy-wide net-zero greenhouse gas emissions by 2045, California needs to sharply reduce emissions from all sectors. It is also clear that some emission reductions will be extremely difficult to achieve, such as from agriculture, and it is possible that reductions from certain, limited industrial processes would be extraordinarily expensive. As such, additional measures that are capable of removing carbon dioxide from the atmosphere can play a valuable role in securing the net reductions necessary as quickly as possible. California will need to explore emerging carbon dioxide removal technologies, while also capitalizing on the significant opportunities for nature-based climate solutions to achieve some of the necessary carbon dioxide removal. However, these **carbon dioxide removal (CDR) measures are not a substitute for reducing emissions directly from the pollution source**, a theme clearly articulated throughout the EJAC recommendations as well.⁴³

In E3's 2020 PATHWAYS modeling of carbon neutrality scenarios prepared for CARB, all three scenarios directly reduce greenhouse gas emissions *at least* 80% below 1990 levels by 2045, with

⁴² California Air Resources Board, Preliminary Draft of EJAC Recommendations.

https://ww2.arb.ca.gov/sites/default/files/2022-04/EJAC%20Workgroup%20DRAFT%20Recommendations_4_1_22.pdf

⁴³ Ibid.

CDR strategies accounting for the remaining 8-20% of emissions to achieve net-zero emissions.⁴⁴ The “balanced” scenario, which intends to balance carbon mitigation measures with developing carbon removal technology, achieves an 87% reduction in greenhouse gas emissions, with the remaining 13% of emissions removed from the atmosphere. This modeling demonstrates that emission reductions from pollution sources should lead the way to achieving net-zero greenhouse gas emissions, with removal strategies utilized only to balance out the last tranche of emissions that may prove exceedingly expensive to abate—at least on the timeline necessary.

The draft Scoping Plan models California achieving net-zero greenhouse gas emissions by reducing gross emissions levels 78% by 2045 (below the 1990 baseline), leaving the state reliant on CDR strategies to balance out residual emissions of 95 million metric tons of carbon dioxide-equivalent (MMT CO₂e) from GHG Inventory sectors⁴⁵—22% of the 1990 baseline level. In addition, the draft Plan indicates that natural and working lands (NWL) are projected to be a net emissions source of approximately 8 MMT CO₂e from 2025-2045,⁴⁶ with CDR expected to compensate for these emissions *in addition to* the significant scale of removal that would be needed to address emissions remaining from AB 32 GHG Inventory sectors. That means California would need to remove over 100 MMT of carbon dioxide from the atmosphere annually by 2045 to achieve net-zero emissions.

These results indicate that the draft Plan achieves lower gross emission reduction levels and relies on significantly higher levels of CDR to achieve net-zero emissions than modeled by E3 in all three scenarios of the carbon neutrality report—including the “Balanced” and “High CDR” carbon neutrality scenarios. Moreover, the draft Plan would achieve significantly lower gross emission reductions than outlined in AB 1395 (Muratsuchi), which was passed by the State Assembly in 2021 and would require a 90% reduction in gross emissions by 2045.

- It is absolutely imperative that the final Scoping Plan maximizes gross emission reductions from pollution sources and relies on carbon dioxide removal *only* for the last tranche of emissions from hard-to-abate sectors.

Carbon capture and sequestration is likely necessary, but requires robust safeguards

If deployed with robust environmental justice protections, environmental integrity, and as part of a full suite of climate strategies, CCS can potentially achieve carbon reductions to support California achieving its net-zero goal, especially in hard to abate sectors such as cement. However, **the future efficacy of CCS in California depends on making sure carbon dioxide is securely, safely and permanently contained, not used for further fossil fuel production, and that any processes**

⁴⁴ California Air Resources Board “Achieving Carbon Neutrality.”

https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf

⁴⁵ California Air Resources Board, Draft Scoping Plan PATHWAYS Data.

<https://ww2.arb.ca.gov/sites/default/files/2022-05/2022-draft-sp-PATHWAYS-data-E3.xlsx>.

⁴⁶ California Air Resources Board, Draft 2022 Scoping Plan Update, pg 72.

<https://ww2.arb.ca.gov/sites/default/files/2022-05/2022-draft-sp.pdf>

and outcomes address equity and community concerns, particularly for communities that bear a disproportionate burden of climate impacts and harmful air pollution.

The draft Scoping Plan notes that capturing carbon from emissions sources has the potential to reduce the emissions of health-harming co-pollutants.⁴⁷ At the same time, the draft recognizes the need to understand and address potential air quality impacts resulting from carbon capture deployment. However, the draft Scoping Plan falls short of proposing concrete steps to *realize* potential benefits and ensure communities will not experience persistent or worsened air pollution as a result of CCS deployment. CARB should advance targeted air quality measures that ensure CCS does not worsen local air pollution and that air quality improvements are realized wherever possible – particularly in communities that are overburdened by pollution. This may include ensuring that a robust amount of fuel substitution and/or efficiency technologies are deployed at the site to minimize the amount of on-site pollution occurring before deployment of the CCS technology. Given the potential for persistent and continuing harm to these communities, EDF suggests that CARB not support any new CCS project without meaningful local community engagement.

While CCS has promise to mitigate carbon emissions in hard-to-abate sectors of the economy, it should not be deployed to expand fossil fuel production or to slow the market transition away from fossil fuels. Cement is a sector that could benefit significantly from the use of carbon capture technology because of the inherent challenges in fully decarbonizing the production process. The draft Plan assumes carbon capture deployment on 40% of cement production by 2035 and 100% by 2045. However, the assumed role of CCS at petroleum refineries raises significant concerns that surrounding communities will experience persistent local air pollution burdens for decades to come. CCS should not be a tool to prolong fossil fuel production in California. To that end, the Scoping Plan should not assume CCS deployment at refineries. Finally, we request that CARB make clear the assumed carbon capture rate in the draft Plan to enable a full evaluation of the proposed role of CCS.

- Stored carbon dioxide must be safely and permanently contained, the draft Scoping Plan should not assume CCS for further fossil fuel production, and community concerns must be fully addressed as projects are developed.
- The draft Scoping Plan should clarify that local air pollution, at a minimum, is not made worse around the installation carbon capture and wherever possible, air quality should be improved.
- CARB should make clear the assumed carbon capture rate in the draft Plan to enable a full evaluation of the proposed role of CCS.

EDF again commends the staff of CARB and partner agencies on the significant amount of work that has gone into this draft Scoping Plan over the previous year. This process, and the final product, will be an example of California's climate leadership, and EDF strongly encourages CARB to increase the ambition of the final product to match the leadership this climate moment requires. California

⁴⁷ Ibid., pg 70.

needs to not only maximize our own emission reductions in the current decade, but actions the state takes - or falls short of taking - will be the example for other states and countries to follow.

Sincerely,

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